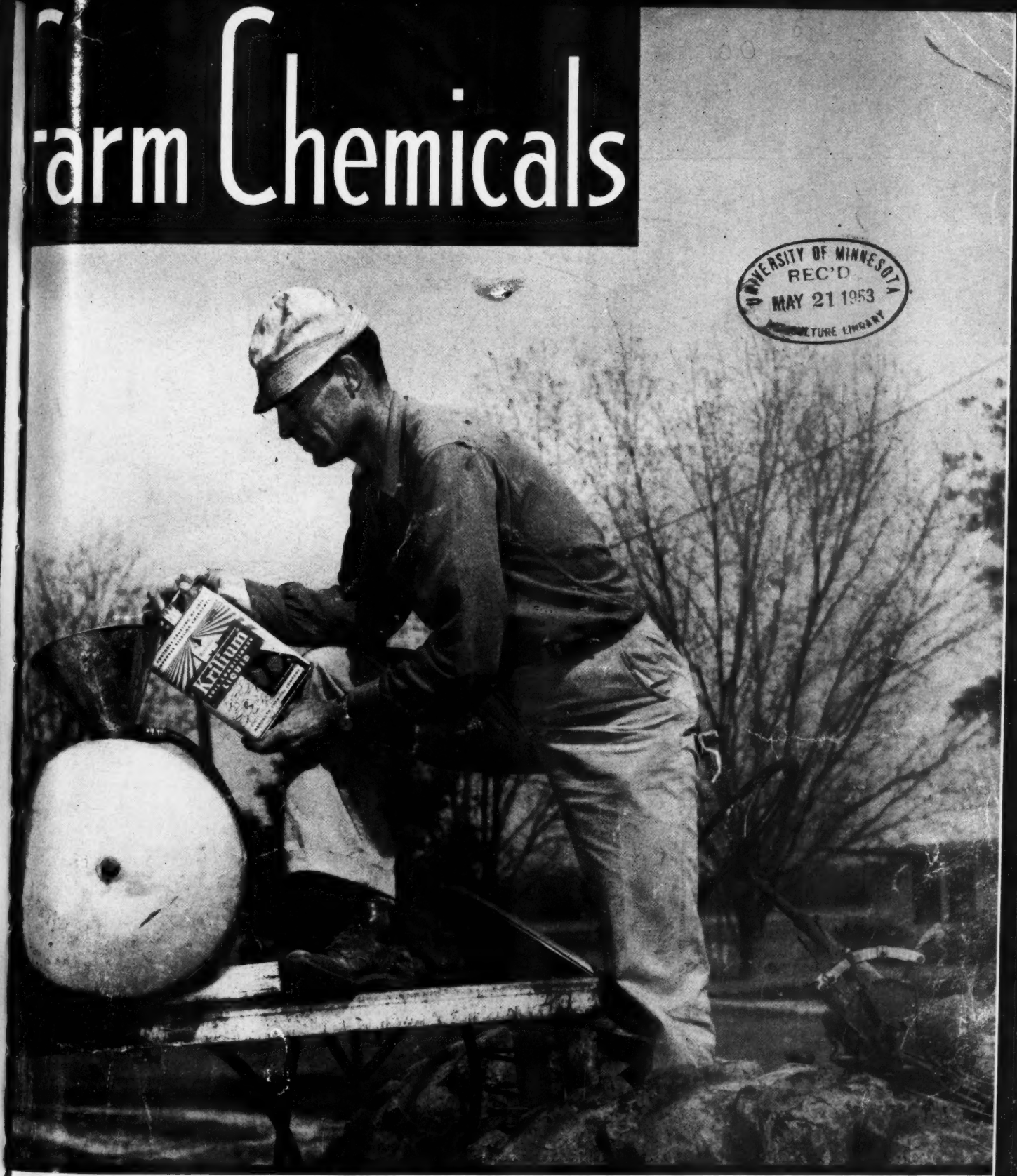
arm Chemicals



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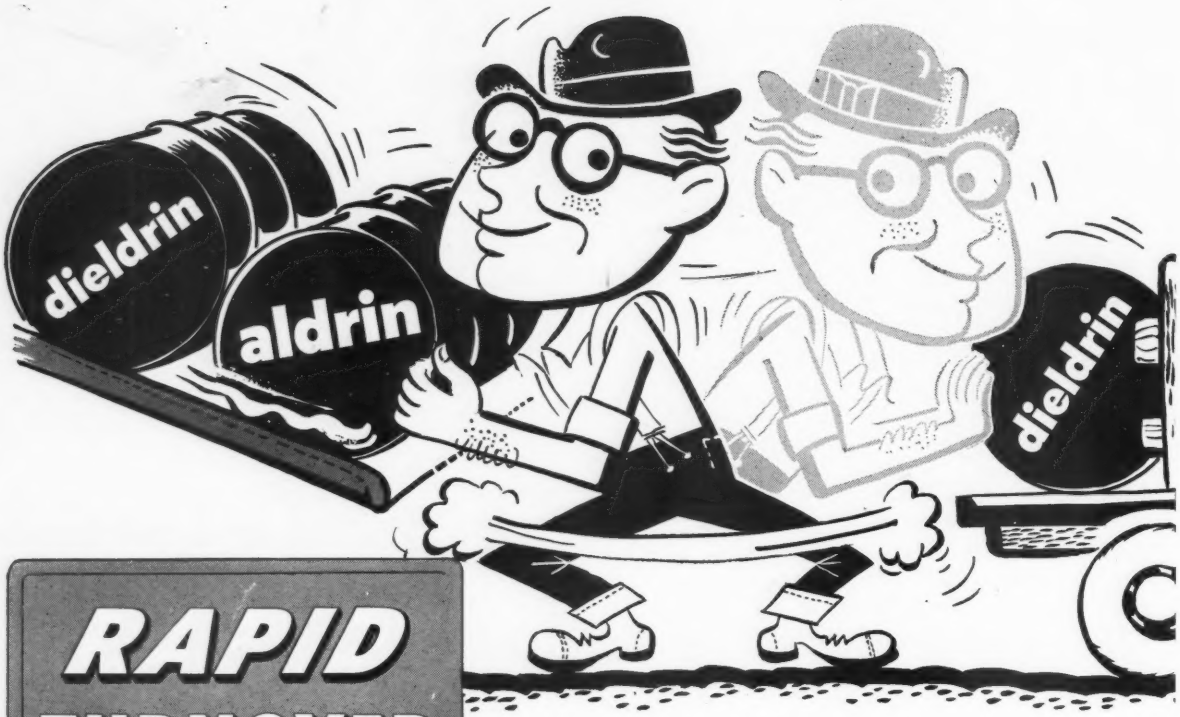

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Cotton growers demand more and more

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Aldrin and dieldrin, in use only a few years, have won the acclaim of growers throughout the cotton belt. In the 1952 season these insecticides proved real money makers for formulators. Powerful advertising and highly successful use have put aldrin and dieldrin in the high-turnover, high-profit class.

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In this issue . . .

All eyes are on Washington this month. The reason is simple. Members of the pesticide industry are awaiting eagerly the outcome of the Delaney and the Miller bills which concern the introduction of chemicals. FARM CHEMICALS has rounded up all the information available on the subject and we present it on page 13 in this issue. Included are comments from the National Agricultural Chemicals Association and industry leaders, an analysis of both bills and their complete text to help busy industry personnel get a quick picture of a complex situation.

Fertilizer mixers have plenty of problems when it comes to storing their materials. Segregation and hard cones are only two. A novel answer to these problems is presented in R. W. Phillips article on a special conveyor storage setup. It appears on page 24.

"Cotton Enemy Number One" is what the pink bollworm rapidly is becoming. This cotton menace, which is causing thousands of dollars of damage in the South every year, is described on page 28 by Avery S. Hoyt, of the USDA.

Grace Chemical Co., newcomer to the farm chemicals field, is wasting no time. The company's $19,000,000 nitrogen plant is under construction near Memphis, Tenn. Further details, page 32.

Lots of general information about systemic pesticides and what they can do has been disseminated among the industry in the last few months. For a complete summary of the development of systemics and of what they can be expected to do, turn to page 35.

Introduction of high analysis fertilizers to Tennessee farmers is the major boasting point of the Tennessee Farmers Cooperative, described in this month's special FARM CHEMICALS feature; page 40.

The second and concluding portion of our series on introduction and marketing of pesticides starts on page 46. It was prepared by the Food Protection Committee.

Soil conditioners for the farm still may be a long way in the distance, as far as large scale use is concerned, but you will be interested in the new Monsanto formulation of Krilium for row crops—page 49.

Grasshoppers, Mormon crickets, chinch bugs and wheat stem sawflies—they'll all be back this year causing crop destruction. For USDA survey maps on expected infestations, consult the article on page 50.

Fertilizer manufacturers, always on the lookout for new ways of convincing farmers of the value of using more plant foods efficiently, will welcome the pertinent points made in the article by Dr. Emil Truog, of the University of Wisconsin, on page 55.

farm chemicals

Formerly
American Fertilizer & Allied Chemicals
Established 1894
PIONEER JOURNAL OF THE FARM CHEMICALS INDUSTRY

Vol. 116 **MAY, 1953** **No. 5**

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Cover Story

Soil conditioners for agriculture were quicker coming than most industry personnel thought. At least one conditioner is available for use on row crops. For a story on Krilium Liquid, and details on its use, see the picture story on page 49. Cover photo shows worker pouring liquid concentrate into tank at rear of tractor for easy application to soil.

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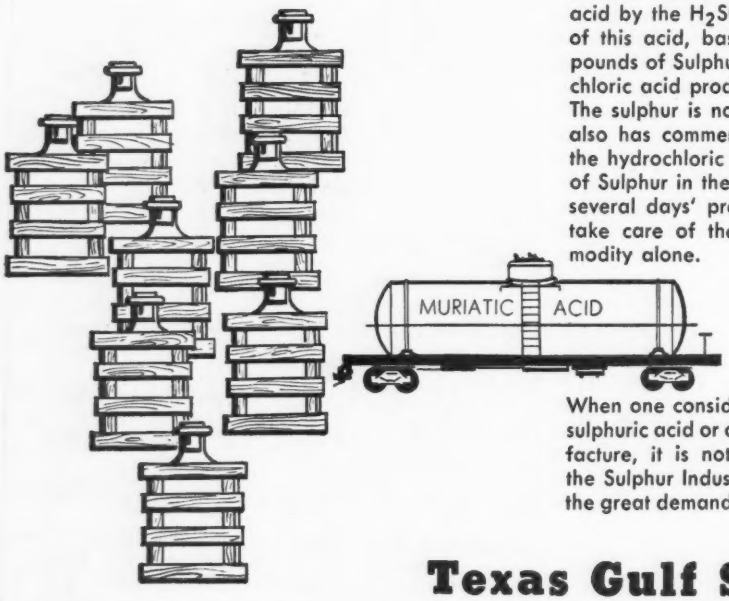
Sulphur

Loading a ship with Sulphur at Galveston

Thousands of tons mined daily, but where does it all go?

PARAPHRASING an old saying: 'It takes a chemical to make a chemical,' certainly applies to hydrochloric acid.

No chemical engineer has to be told how hydrochloric acid is made but sometimes with the mind focussed on the word "hydrochloric" little thought is given to another word "sulphuric." It is this word that calls attention to the fact that to make one net ton of 20° Bé hydrochloric acid by the H_2SO_4 process requires about 950 pounds of this acid, basis 100%, which is equivalent to 320 pounds of Sulphur. About one third of the annual hydrochloric acid production is made by the use of sulphuric. The sulphur is not lost because salt cake, a by-product, also has commercial value. But any way you figure it, the hydrochloric acid industry is an important consumer of Sulphur in the form of sulphuric acid. In fact, it takes several days' production from all the Sulphur mines to take care of the annual production of this one commodity alone.



When one considers all the other chemicals that require sulphuric acid or other Sulphur compounds for their manufacture, it is not difficult to appreciate how faithfully the Sulphur Industry is serving industry today in spite of the great demands made upon it.

Texas Gulf Sulphur Co.

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Mines: Newgulf and Moss Bluff, Texas

farm chemicals facts

. . . Briefly Noted

A leading USDA soil researcher has been named manager of agricultural services for Grace Chemical Co. The appointee, Dr. Ralph Q. Parks, in charge of research in soil management and fertilizer use for the Department of Agriculture, is well known in the agriculture field. He has been associated with the Ohio Experiment Station, the U. S. Plant, Soil and Nutrition Lab at Ithaca, N. Y. and the USDA Experiment Stations at Auburn, Ala. and Beltsville, Md.

Parks

New address for the American Potash Institute is The American Potash Institute Building, 1102 16th St., N.W., Washington 6, D. C. Old location was 1155 16th St.

Fertilizer trade association heads authored articles in the March issue of **The National Grange Monthly**. Russell Coleman, president of the National Fertilizer Association wrote about "Fifty Years of Progress with Fertilizer" while Paul T. Truitt, president of the American Plant Food Council gave his views on "Fertilizer and the Future."

A new soil conditioner called Tronatil is being marketed by Eston Chemical division of American Potash & Chemical Corp. The conditioner contains vinyl acetate-maleic anhydride copolymer resin. According to the company the material is the most effective soil conditioning chemical known.

Thirty eight graduate fellowships for the academic year 1953–54 have been set up by Allied Chemical & Dye Corp. to promote study in the fields of chemistry and chemical engineering. They provide $1500 for unmarried fellows and $2000 for married fellows.

R. L. Zachry has been promoted to the post of director of the quality control division of Fulton Bag and Cotton Mills. Responsibility for control previously rested with each division of the company. Succeeding Zachry in his former position as general superintendent of the cotton mills is Clarence C. Chavous.

Timothy W. Collins has been appointed general personnel director for Pittsburgh Plate Glass Co. Collins joined the company in 1945 as director of wage.

Potent insecticides which are not poisonous to men or animals have been developed by entomologists at the California Citrus Experiment Station. Credited with producing the insecticide are Drs. R. C. Blinn, F. A. Gunther, G. E. Carman and R. L. Metcalf. They reported the new insecticides are hydrocarbons which attach themselves to vital chemicals in the insect's system and suspend its life processes.

Increased production of fertilizers by American Agricultural Chemical Co. will be enabled by purchase of a 25-acre tract of land 12 miles south of Ft. Dodge, Iowa. The company operates 30 fertilizer and chemical plants in the country.

Sales were on the upswing during the first quarter of 1953 Diamond Alkali reported. A continuation of this trend in the second quarter was forecast by Raymond F. Evans, company president.

E. K. Schultz has been appointed a sales representative for Arkell & Smiths in the Michigan area.

Two giant nitrogen and two hydrogen purification generators will help the production of ammonia for fertilizer at Brea Chemicals, Inc. at Brea, Cal. C. F. Braun & Co., Alhambra, Cal. bought the units from Air Products, Inc., Allentown, Pa. The generators are capable of producing enough synthesis gas for 235-tons of ammonia daily.

CALENDAR

May 17-19—Chemical Specialities Mfrs. Assn., Chicago, Ill.

June 11-13—Mfg. Chemists Assn. & SOCMA, White Sulphur Springs, W. Va.

June 11-14—APFC Convention, Hot Springs, Va.

June 15-17—NFA Convention, White Sulphur Springs, W. Va.

Net sales were up 7.8 per cent at International Minerals & Chemical Corp. for the nine months ended March 31. Total was $62,994,231 compared with $58,421,381 for the corresponding nine month period ended March 31, 1952.

American farmers may be backward in their acceptance of fertilizers, but things are really bad in France. The Foreign Commerce Weekly reports that French reticence toward modern plant foods has resulted in a lower average consumption of fertilizers in that country than in many other West European nations.

A price hike for fertilizers in Virginia went into effect last month as a result of increased intrastate rail freight rates. The price rise ranges from less than a dollar to several dollars a ton.

Willard R. Ashburn has been named vice president and general counsel for Smith-Douglass Co., Inc., effective July 15. Ashburn is senior partner of the law firm of Ashburn, Agelasto and Sellers.

Ralph B. Douglass, in announcing the election, said Ashburn will continue as general counsel of the corporation and will share with other top management representatives in executive and administrative direction.

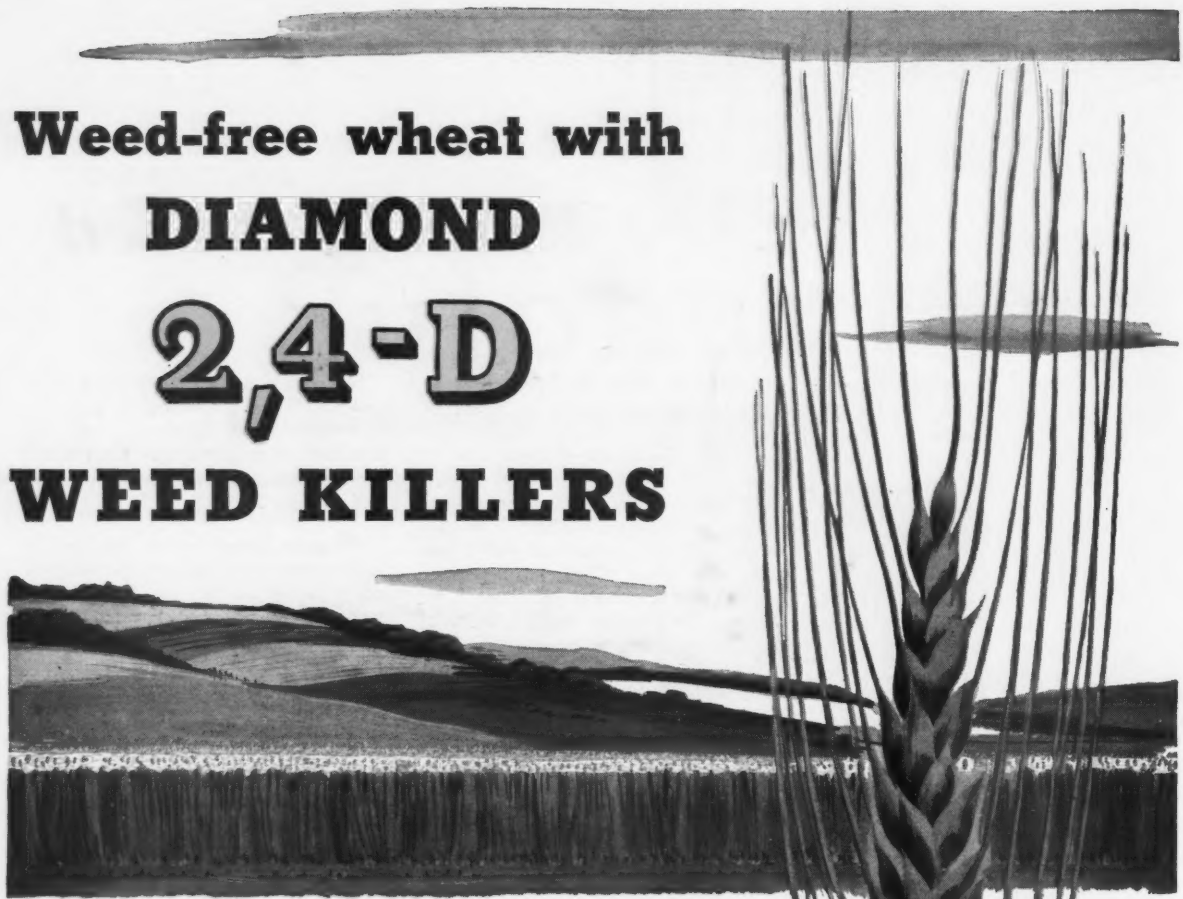
Ashburn

The new vice president has been general counsel for Smith-Douglass since 1936.

Some members of the farm chemicals industry are following the baseball season with a special interest this year. The reason is the availability of a formulation of Krilium soil conditioner for treatment of the "skinned area" of baseball diamonds. Monsanto Chemical Co. says tests on several ball fields have shown effectiveness of the product.

Recovery of nicotine sulfate for pesticide usage from waste tobacco has been developed at India's National Chemical Laboratory. Kerosene is used as the extracting agent after the pulverized tobacco is mixed with lime and common salt.

Weed-free wheat with DIAMOND 2,4-D WEED KILLERS



DIAMOND 2,4-D kills weeds right down to their root systems—and has little or no effect on most beneficial grasses. When used on weeds that choke off wheat and other cereal crops, bigger and better yields result.

Easy to apply, DIAMOND 2,4-D mixes readily in hard or soft water.

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and	Butoxy Ethoxy	BHC	36% Technical
2,4,5-T	Propanol Esters (low volatile type)	K-101	Acaricide
DDT	100% Technical	HEXACHLORO-BENZENE	Seed Disinfectant

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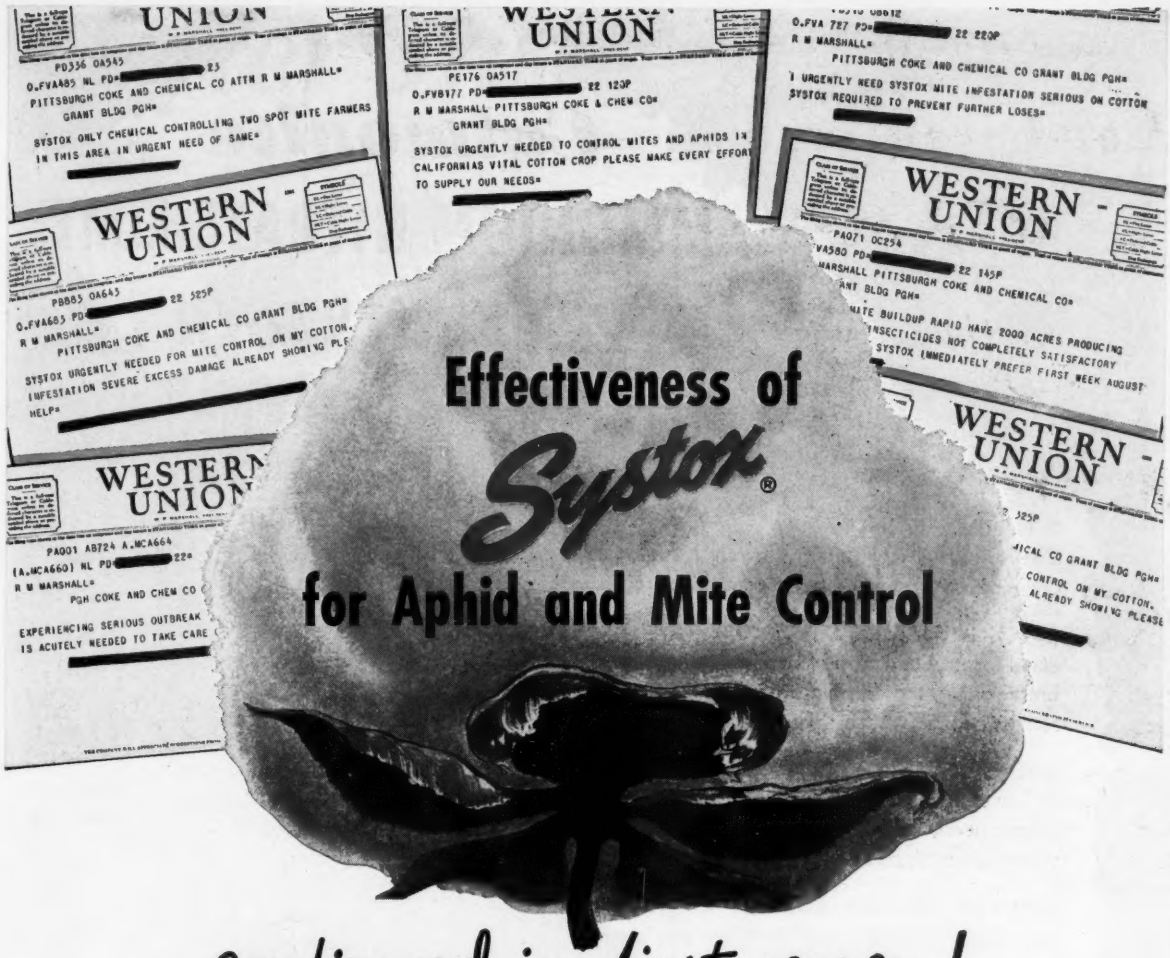
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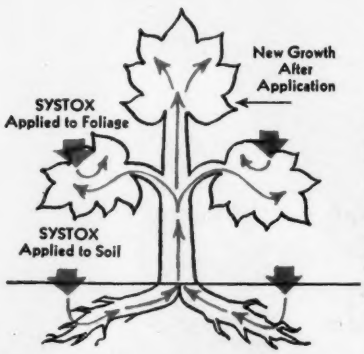

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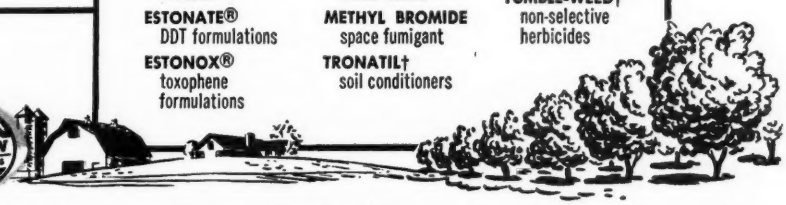

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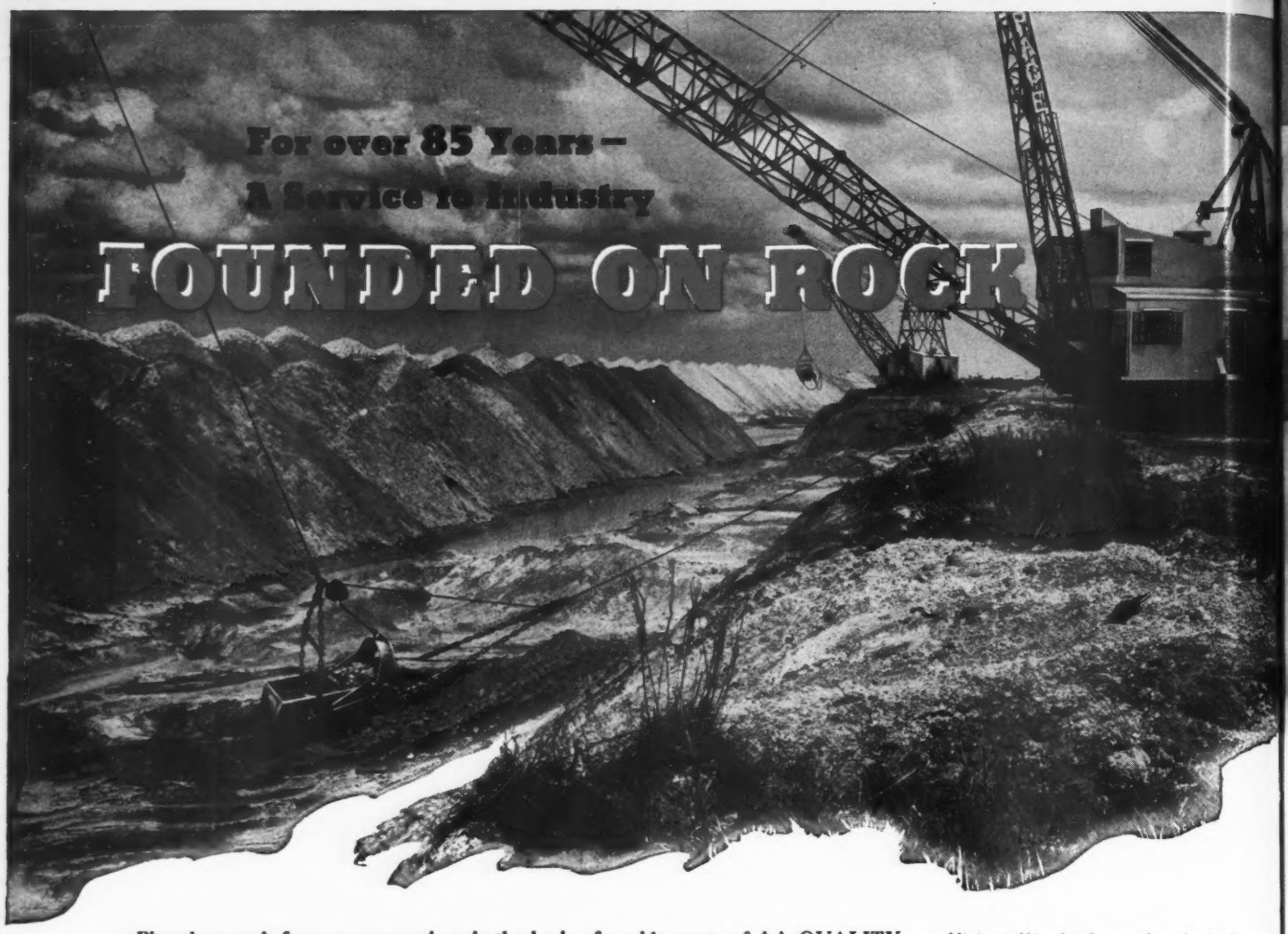

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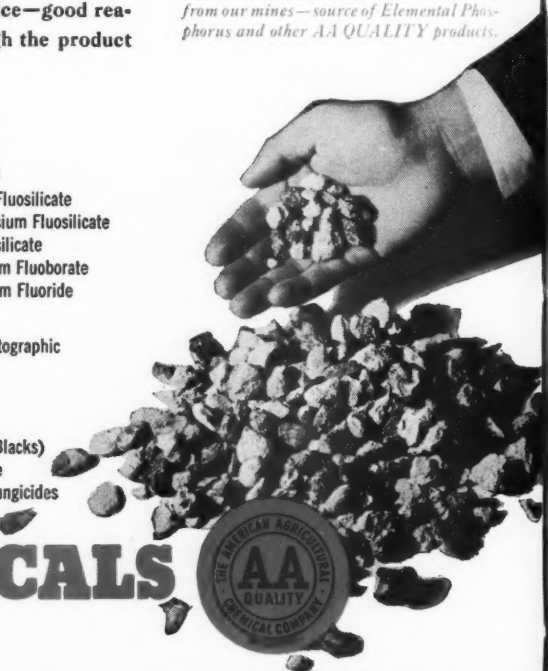

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farm chemicals outlook

Report from Washington
by Fred Bailey & John Harms

Miller pesticide bill is considered here to be more favorable to the pesticide industry than earlier control measure sponsored by Rep. Delaney (D.-N. Y.)

The bill, sponsored by Rep. A. L. Miller (R.-Neb.), is essentially as we predicted last month but is even more favorable than we indicated.

Some opposition may be expected. The question whether the Delaney bill will also be heard when hearings are held had not been answered as we went to press, for example. Supporters of the Delaney version may be on hand to oppose the Miller version.

The Miller bill will have this advantage, legislatively speaking: The industry and the Agriculture Department likely will be behind it.

Here is a detailed section-by-section legal analysis of the proposals to amend the Food and Drug Act contained in the Miller bill . . . summarized by the National Agricultural Chemicals Association:

Section 2. The term "pesticide" is spelled out in the definition section of the Federal Food, Drug and Cosmetic Act to agree in effect with the definition in existing Federal and State pesticide legislation.

Section 3. The adulteration section of the Act is changed to distinguish pesticide residues from intentional chemical additives to food. Pesticides would be put in a separate section of the law making them entirely distinct from other poisonous and deleterious substances.

Section 4. This would be a new section dealing specificially with the establishment of tolerances for pesticides.

Section 407-(a). The residue of a poisonous or deleterious pesticide could not be on a food in a quantity exceeding the tolerance set by the FDA administrator unless such pesticide has been exempted.

Section 407 (b). Authorizes the establishment of tolerances to the extent necessary to protect public health. In establishing the tolerance or an exemption from it, FDA must give due consideration to the necessity for the production of an adequate and wholesome food supply.

Section 407 (c). This section authorizes FDA to exempt any specific pesticides from the necessity of a tolerance when it is not necessary to protect the public health.

Section 407 (d) (1). When application is made for registering a pesticide for sale under the Federal Insecticide, Fungicide and Rodenticide Act, the applicant would request Federal Security Administrator to establish a tolerance.

Research and other technical data, including toxicity and residue information, would be supplied as prescribed in the Act.

Section 407 (d) (2). A tolerance then would be set within a 90-day period upon certification by the Secretary of Agriculture that the pesticide was useful. If no tolerance were required, the pesticide would be exempted.

Section 407 (d) (3). The applicant or the Administrator is given the right

to request appointment of a special advisory committee to pass upon the data submitted and to make recommendations to the Administrator. In such cases, the committee would have 60 days in which to make recommendations.

Section 407 (d) (4). Any tolerances established would be effective immediately upon publication in the Federal Register.

Section 407 (d) (5). Interested parties are given the opportunity to file objections to any tolerance issued, although this would not stay their effectiveness. This procedure for providing objections recognizes the public nature of tolerance regulations and at the same time avoids lengthy public hearings.

Section 407 (e). The administrator is authorized to establish tolerances or to exempt pesticides from tolerances upon his own initiative under procedure specified in previous sections.

Section 407 (f). Data submitted to the Administrator and to advisory committees would be deemed confidential and may not be divulged to others than specified authorized persons.

Section 407 (g). The advisory committees set up under the proposal would be composed of an equal number of experts selected by the Administrator, by the applicant, and by the chairman of the Food Protection Committee of the National Research Council. Such members would be selected on the basis of their familiarity with the specific question involved.

Section 407 (h). Proponents of tolerances would be given the right of consultation with the advisory committees in the consideration of any research data presented.

Section 407 (i). An appeal from any adverse order of the Administrator may be made in the U. S. District Court for the District of Columbia.

Section 407 (j). Temporary tolerances are authorized for pesticides used on an experimental basis in accordance with the Federal Insecticide, Fungicide and Rodenticide Act. The limited hazard involved in experimental use is expressly pointed out.

Section 407 (k) (1). Expected tolerances based on hearings already held in 1950 would be issued after the effective date of the proposal and would be subject to new court review procedure and to the new method contemplated for amendment and repeal.

Section 407 (k) (2). Such tolerances as have become effective before the effective date of the new proposal would not be affected except in the manner of amendment or repeal.

Section 407 (l). The Secretary of Agriculture is directed to certify the usefulness of a pesticide to the Food and Drug administrator within a reasonable time after a request has been made.

Section 407 (m). Provision is also made for setting up rules and regulations to carry out the Act after notice and public hearings.

Declining farm income is the biggest unfavorable factor in fertilizer sales prospects this season, but indications are that farmers are turning to a volume of production to make up for decreased per unit costs. This would tend to point to a high level of fertilizer and lime consumption despite falling prices.

The odds now favor a cut in the government's subsidy for conservation practices. But it's doubtful that Congress will go along with USDA Secretary Benson's proposal to lop $110 million off the 1954 program.

There's strong feeling in Congress to cut down on the $250 million program, but most congressmen from the farm areas don't think such a big slice is necessary.

Any cuts in the program would be aimed at payments for what Benson terms "recurring annual practices" . . . fertilizer and lime applications. Farm Bureau and Grange, the two big farmer organizations, favor large cuts in the program although their efforts to chop it down last year failed.

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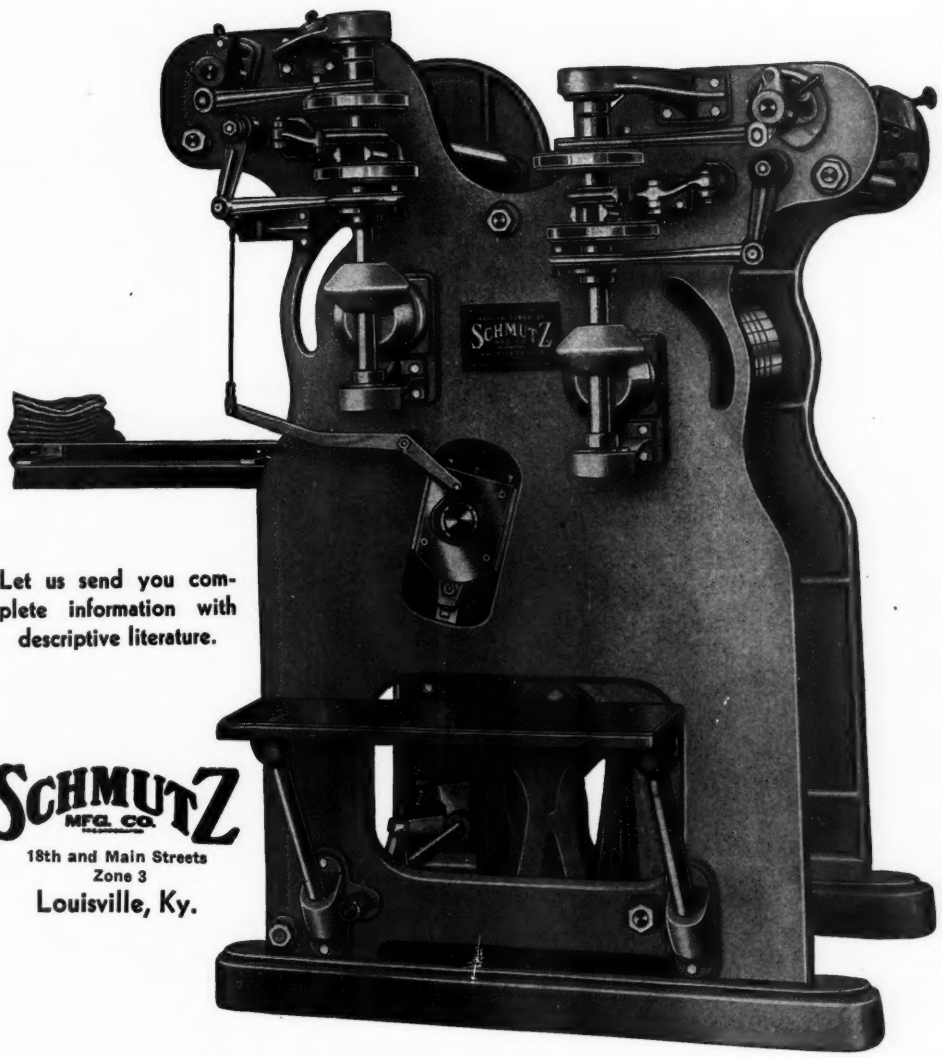

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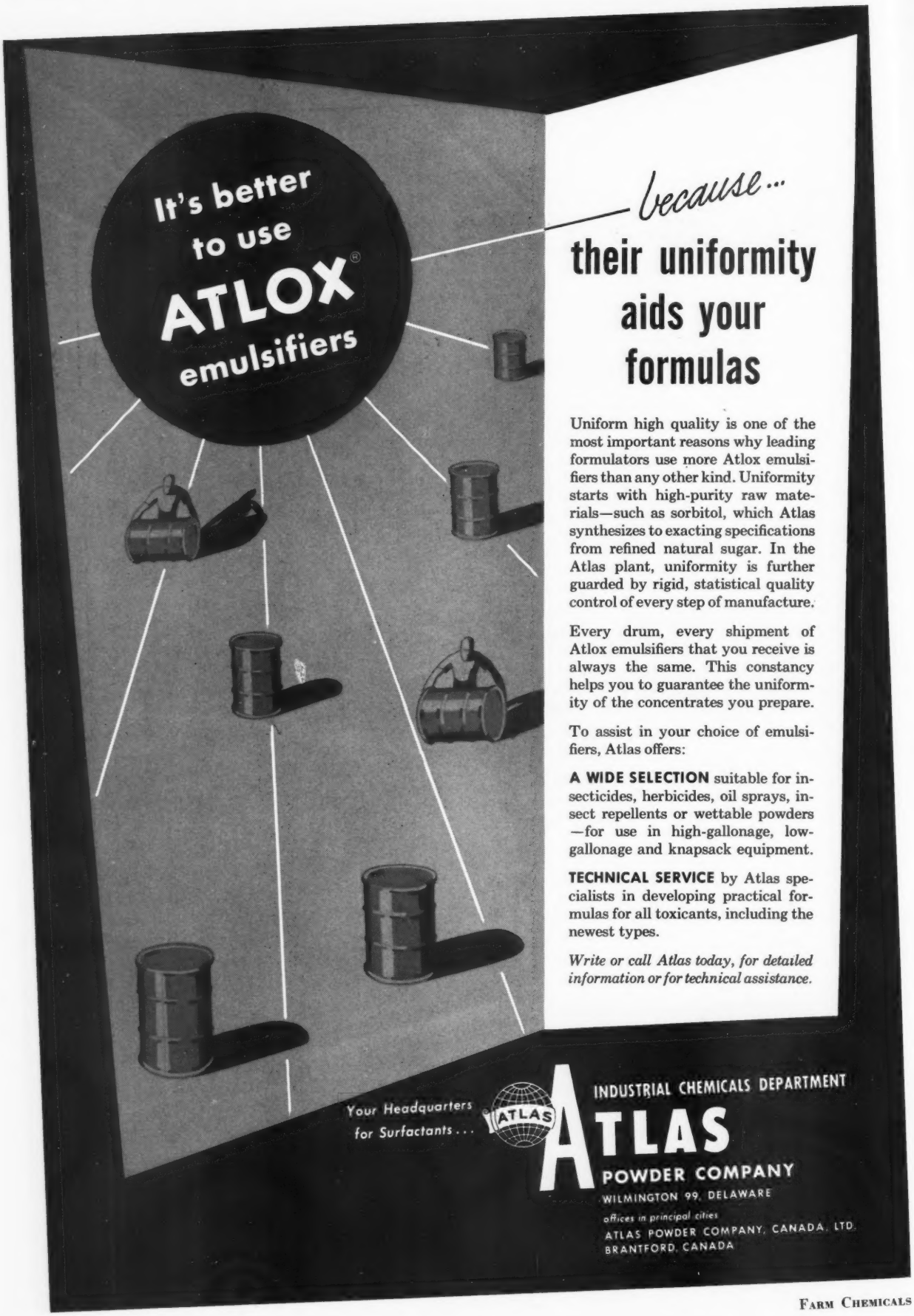
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Farm Chemicals questionnaire to pesticide manufacturers shows

Associations, Industry Leaders Back Miller Bill

SOLID support for the Miller bill to regulate pesticides was voiced in the pesticide industry last month as industry members awaited a Congressional showdown.

Two key organizations, the National Agricultural Chemicals Association and the American Farm Bureau Federation lined up behind the legislation as the most favorable put forward to amend the Federal Food, Drug and Cosmetic Act.

Other support for the legislation came from leaders in the industry, who gave their views in response to a special FARM CHEMICALS questionnaire.

In endorsing the Miller bill in preference to one sponsored by Rep. Delaney (D-N. Y.) NAC urged that the legislation be "vigorously endorsed by all manufacturers of pesticides, the research agencies and by the agricultural producers, organizations and farmers.

"Contrarily," it requested, "all groups should oppose the Delaney bill, which was previously introduced in the House."

Other Support

In a similar policy statement, the Farm Bureau recommended support for the Miller bill, supporting in full the objectives of the legislation, which was introduced by Rep. A. L. Miller (R-Neb.)

Another organization, the Manufacturing Chemists' Association, Inc., told FARM CHEMICALS it was holding off formulation of an official opinion on the various proposed legislation until its Chemicals in Foods committee prepares a statement of policy. (At press time no such statement had been disseminated to the press.)

Rep. A. L. Miller

In its analysis of the Miller bill the NAC stated it feels the measure "adequately protects the public health and at the same time protects the manufacturer of the pesticides, the growers and handlers of commodities on which pesticides are used."

FARM CHEMICALS presents its analysis of the Delaney and Miller bills on page 17. Because this magazine considers the pending legislation of paramount importance to industry members we include also complete text of both bills.

Presentation of complete text of the bills is especially appropriate, this magazine feels, in light of only sketchy knowledge of the bills expressed in several answers to our queries.

Although all who answered the questionnaire supported the Miller bill in preference to the Delaney legislation, several opposed any further legislation and went along with the Miller bill only if additional legislation became mandatory by the actions of Congress.

FARM CHEMICALS asked these five questions in its letter to industry leaders:

1. Do you think additional pesticide legislation is necessary to safeguard the American public?

2. If so, which of these two bills now in Congress do you think most nearly answers the need; the Delaney or Miller?

3. Would you like to see any changes in the bill which you support? Do you think any provisions were left out that should have been included?

4. Will your company actively support the legislation you favor?

5. What effect do you think the new legislation will have on the pesticide industry, in regard to increased hardships in the marketing of pesticide chemicals?

Here is a summary of replies:

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tion, as to whether additional legislation was needed, all persons expressing an opinion answered "no."

Most explained that they thought existing legislation, if properly administered could do the job, but most were equally ready to admit that some new legislation probably was inevitable.

Opposes New Laws

Most dogmatic in his opposition to new legislation was **G. A. McLaughlin,** of McLaughlin Gormley King Co.

Said McLaughlin: ". . . *we are specifically opposed to more of this legislation. It is the writer's personal opinion that a great deal of this country's lack of production and earning efficiency is due to a plethora of laws. . . . One can hardly make a simple business move without violating some federal, state, county or municipal regulation. . . . This is a condition which should be remedied at the earliest possible moment.*

"*What better place to start than in the field of pesticide legislation, where we already have so many regulations as to make each of us practically a Houdini before we can make any progress at all. . . . The record stands that no one can state positively that a death has been caused anywhere in the United States because of eating food poisoned with properly applied pesticides.*"

McLaughlin attacked the policy of some members of the industry who feel that "*whether we like it or not we are faced with some kind of legislation. We feel that this is an evidence of weakness not justified by the circumstances.*"

According to **J. G. Brunton,** of Diamond Alkali Organic Chemicals Division, "*the American public have seemingly been able to get by in pretty fine fashion as far as pesticide legislation is concerned on the laws we now have on the books.*"

Franklin M. Thomas, of Central Chemical Corp. declared that "*any more legislation and it will require a prescription to buy insecticides.*"

2. Unanimous support for the Miller bill in preference to Delaney's measure was expressed by industry leaders answering the second question.

Typical of replies was this from **R. B. Stoddard** of U. S. Industrial Chemicals Co.:

Prefers Miller Bill

"*We regard the Delaney bill as undesirable and unworkable. The Miller bill on the contrary seems to be generally acceptable to the bulk of the industry and to most of the large farm organizations.*"

Stated **M. C. Van Horn,** of Florida Agricultural Supply Co.: ". . *Of the proposed measures, the new Miller bill . . . seems to be the better of the two. . . .*"

Clyde T. Marshall, of Commercial Solvents Corp., said that "*In principle it certainly does appear that the Miller bill would serve both public and industry interests far better than the Delaney bill.*"

3. No one answering the questionnaire offered any suggestions for adding to or changing the legislation he supported.

4. Among persons committing themselves or their companies on the question of support all said they would actively back the legislation of their choice.

5. The final question elicited some provoking comments from correspondents and showed that industry members represented in this sampling of opinion were exactly split on how new legislation would work.

Wrote **W. Newton Long,** of Miller Chemical & Fertilizer Corp.: "*We are under the impression that the Miller bill—if passed— will not adversely affect the sales of pesticide chemicals. . . .*"

Delays Foreseen

Edmund C. Hyry, of Associated Sales & Supply Co. had the opposite view. He said "*any new legislation will slow up the commercial development of new chemicals. In some cases this may work to the disadvantage of farmers and growers in controlling agricultural pests.*"

Paul Mayfield, of Hercules Powder Co., also was among the optimists. He said he "*did not believe that the Miller bill will cause hardship of any kind in the marketing of pesticide chemicals.*"

R. B. Stoddard, of U. S. Industrial Chemicals Co., took more of a middle view. "*We regard it as certain that even at best and assuming the Miller bill is passed without substantial alteration, the task of introducing and marketing new pesticide chemicals will be more difficult, although it does not now appear that the difficulties will be insuperable.*"

Van Horn, in his statement, said he thought that if the legislation is properly handled, "*we believe the pesticide industry can and will continue in an orderly fashion despite the legislation.*"

Another industry leader, who didn't want his name or company name used in connection with a direct quotation, thought the Miller-Aiken (Sen. George D. Aiken, R-Vt. is sponsoring a companion piece of legislation in the Senate) would help clear up the present tangle of legislation relating to pesticides.

His statement follows:

"There is no question but that the passage of the Miller-Aiken bill will resolve certain difficulties which have been most annoying during the past few years, particularly those pertinent to insecticidal residues on food crops.

"On the other hand the Delaney Bill contains certain provisions which would involve considerable hardships to industry and would probably impede the flow of pesticides to farmers and others who need to use them for the maximum benefit of the country.

Recognize Responsibility

"We recognize fully the responsibility of the insecticide manufacturer to supply products, properly formulated and with proper and adequate recommendations and cautions, so as to accomplish a maximum of protection from pest activities with a minimum hazard to all concerned, including the workmen in the manufacturing plant, those applying the pesticides and the ultimate consumer of the agricultural products on which these chemicals are used.

"We believe that present legislation and procedures, with the exception of the matter of establishing residue tolerance limits, are reasonably adequate, and that provisions in the Miller-Aiken Bill

Farm Chemicals Analysis of Bills

Delaney	Miller
1. Amends Federal Food, Drug & Cosmetic Act (carries out recommendations of Delaney committee made during the past two years).	**1.** Amends Federal Food, Drug & Cosmetic Act.
2. Concerned with "chemical additives" (including pesticides).	**2.** Concerned with pesticides exclusively. (Rep. Miller plans to sponsor two other bills for food processing and cosmetics.)
3. Must submit proof chemical is safe: composition, tests, samples, methods of analysis, directions for use, etc. Provides for exemptions to be made by qualified experts who investigate the safety of such chemical additives.	**3.** Chemical is safe if it meets tolerance requirements, or if it is exempt. Tolerances to be set up by the administrator. If applicant requests that a tolerance be set up for his product he must submit complete data on the chemical.
4. Approval to be obtained from Federal Security Administrator. He can withdraw approval at any time, with notice to applicant, if he finds by experience or new methods or tests that chemical is unsafe.	**4.** Approval obtained from Federal Security Administrator, after applicant meets tolerance requirements.
5. No advisory committee provided for.	**5.** Provides for advisory committee to consult with the Federal Security Administrator. Equal number of experts selected by administrator, applicant, and chairman of the Food Protection Committee.
6. Administrator must issue notice of hearing within 60 days or approval is understood. He may approve earlier or may postpone date to conduct investigations of his own. If the latter, 180 days from date of filing is time limit.	**6.** Administrator must act within 90 days after application is made.
7. No extensive court appeal arrangement. Orders of administrator are subject to judicial review in accordance with the provisions of section 701 (f) of the FDA act, which generally limit court review to the lawfulness of the administrator's act, and not to a review of the evidence.	**7.** Recourse to courts on grounds other than just trying to prove the administrator acted arbitrarily or capriciously in making a decision.
8. Applicant must submit a statement that chemical is required in the production of food.	**8.** Certification by Secretary of Agriculture is sufficient proof that the chemical in question is necessary for use.

supplement present legislation desirably."

Further praise for the Miller Bill was given by another member of the industry, who preferred to remain anonymous. He expressed his opinions in reply to the questionnaire as follows:

'Will Relieve Hardships'

"The Miller-Aiken Bill if passed will actually expediate the marketing of pesticide chemicals and will relieve some of the present hardships under which pesticide manufacturers now have to conduct themselves."

Most observers feel that the procedure as outlined by Miller will, as presently interpreted, work no new hardships on the pesticide industry. Its operation is patterned after an already established procedure followed in the introduction of pesticides.

NAC pointed out that the industry has been voluntarily meeting primary objectives of the Miller bill under present legislation.

Registration of the product under the USDA Federal Insecticide, Fungicide and Rodenticide Act still will be required but in addition, data must be presented to the Federal Security Administrator for the establishment of tolerances where necessary.

What It Does

It should be understood that the law relates only to food entering inter-state commerce. The Miller bill fixes responsibility if and when such products should be found to contain excessive pesticide residues. If the manufacturer has followed the prescribed course set up for registration, and his product is properly labeled taking into consideration tolerances for the pesticide involved, the formulation is considered safe when used according to recommendations.

Advisory Committees

The section relating to establishment of advisory committees under the Miller measure to pass on submitted data and to make recommendations to the Federal Security Administrator was commented on favorably by NAC officials.

It is presumed that, under the Delaney measure, public hearings would be held as under the present FFD & C Act. With these hearings, a company could be required to present all information relating to its pesticide—delivering it directly to those who could be counted as competitors in marketing the material.

Under the Miller amendment data could be reviewed by experts who then would render a decision based on complete information delivered only to the committee and analyzed by it.

Under a rather complicated legal arrangement a manufacturer whose product has been rejected by an advisory committee still has recourse to the judicial system where his data can be completely re-evaluated. Delaney provides only for court ruling to determine whether or not the Administrator acted arbitrarily or capriciously in making his decision.

Excellent Record

With all the interest aroused by the current wave of pesticide legislation it is interesting to note that under the Federal Insecticide Act, 45,000 pesticides have been registered without one registration under protest, where residues in food were involved. This is a remarkable record in the eyes of NAC and reflects well on an industry charged with protection of the nation's food resources.

In connection with the tolerances which would be set up under provisions of the Miller bill tentative tolerances resulting from the 1950 hearings are reported unofficially to be approaching final approval. It is expected that when they are approved, and if the Miller bill is accepted as an amendment to the FFD & C Act, they will be added to the legislation. ◆

Complete Text of MILLER Bill

A BILL to provide for the health and protection of the citizens of the United States from harmful chemical additives in pesticides.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the **"Pesticides-Residue Amendment to the Federal Food, Drug and Cosmetic Act."**

Sec. 2. Section 201 of the Federal Food Drug and Cosmetic Act is amended by adding to the end thereof the following new paragraph:

"**(q)** The term 'pesticide' means any substance or mixture of substances used in the production, storage or transportation of food which is intended fo preventing, destroying, repelling or mitigating any insects, rodents, fungi or weeds and other forms of plant or animal life or viruses, except viruses on or in living man or other animals."

Sec. 3. Section 402 (a) (2) of the Federal Food, Drug and Cosmetic Act is amended to read as follows:

"**(2)** if it bears or contains any added poisonous or added deleterious substance which is unsafe within the meaning of section 406, except a pesticide, or if it bears or contains any poisonous or deleterious pesticide which is unsafe within the meaning of section 407;".

Sec. 4. The Federal Food, Drug and Cosmetic Act is amended by adding at the end of section 406 (b) the following new section:

"**Sec. 407.** (a) Any poisonous or deleterious pesticide added to a food shall be deemed unsafe for the purposes of the application of clause (2) of section 402 (a) unless (1) the quantity thereof does not exceed the limits of a tolerance prescribed by the Administrator under paragraph (b) of this section; or (2) the pesticide has been exempted from the requirement of a tolerance by the Administrator under paragraph (c) of this section. While a tolerance is in effect, a food shall be deemed to be adulterated if the quantity of the pesticide which it bears or contains exceeds such tolerance. While a tolerance, or an exemption from a tolerance, is in effect, clause (1) of section 402 (a) shall not apply.

"**(b)** The Administrator shall promulgate regulations establishing a tolerance for any poisonous or deleterious pesticide to the extent necessary to protect the public health. In establishing such a regulation, the Administrator shall give appropriate consideration to the necessity for the production of an adequate and wholesome food supply. Such regulations shall be promulgated in the manner prescribed in paragraphs (d) or (e) of this section.

"**(c)** The Administrator shall promulgate regulations exempting any pesticide from the necessity of a tolerance under

paragraph (b) of this section when such a tolerance is not necessary to protect the public health. Such regulations shall be promulgated in the manner prescribed in paragraphs (d) or (e) of this section.

"(d) (1) Any person submitting an application for the registration of a pesticide under the Federal Insecticide, Fungicide and Rodenticide Act of 1947 (7 U. S. C. 135) may file with the Administrator a petition proposing the issuance of a regulation establishing a tolerance for the pesticide or exempting the pesticide from a tolerance. The petition shall contain data showing (i) the name, chemical identity and composition of the pesticide, (ii) the amount, frequency and time of application of the pesticide, (iii) toxicity information, (iv) tests showing the amount of residue remaining, (v) proposed tolerances for the pesticide, if tolerances are proposed and (vi) reasonable grounds in support of the petition.

"(2) Within ninety days after filing, the Administator shall, after giving due consideration to the data submitted or otherwise before him and after certification by the Secretary of Agriculture that the pesticide named in the petition is useful for the purpose for which the tolerance or exemption is sought, make public a regulation (a) establishing a tolerance for the pesticide named in the petition or (b) exempting the pesticide from the necessity of a tolerance, unless within such ninety-day period the person filing the petition requests that the petition be referred to an advisory committee or if the Administrator within such period otherwise deems such referral necessary, in either of which event the provisions of clause (3) of paragraph (d) of this section shall apply in lieu hereof.

"(3) In the event that the person filing the petition requests within ninety days after filing that the petition be referred to an advisory committee, or the Administrator within such period otherwise deems such referral necessary, the Administrator shall forthwith submit the petition and other data before him to an advisory committee to be appointed in accordance with paragraph (g) of this section provided that the Secretary of Agriculture has certified that the pesticide named in the petition is useful for the purpose for which a tolerance or exemption is sought. As soon as practicable thereafter, but in no event later than sixty days after such referral, the Committee shall, after independent study of the data submitted to it by the Administrator and other data before it, certify a report and recommendations on the proposal in the petition to the Administrator. Within thirty days thereafter, the Administrator shall, after giving due consideration to the data before him including the report and recommendations of the advisory committee, make public a regulation (a) establishing a tolerance for the pesticide named in the petition or (b) exempting the pesticide from the necessity of a tolerance.

"(4) The regulations proposed under clause (2) or (3) of paragraph (d) of this section will be effective upon publication.

"(5) Within ninety days after publication, any interested person may file objections specifying with particularity the changes desired in the regulation and stating reasonable ground therefor. Copy of the objections shall be served on the petitioner, if the proposed regulations were issued pursuant to a petition. The petitioner shall have two weeks to reply to the objections. As soon as practicable thereafter, the Administrator shall make public his action in affirming, modifying or revising the regulation objected to. Such action shall be effective upon publication. The Administrator shall base his order under this clause or under clause (2) or (3) or paragraph (d) of this section on substantial evidence of record including any report or recommendation of an advisory committee and shall set forth as part of the order detailed findings of fact upon which the order is based.

"(e) The Administrator may at any time upon his own initiative propose the issuance of a regulation establishing a tolerance for a pesticide or exempting it from the necessity of a tolerance. The Administrator shall publish such proposal in general terms and shall give any interested person thirty days after such publication within which to file a petition in accordance with paragraph (d) of this section. In the event that no such petition is filed, the proposal shall be published as a regulation and shall become effective upon publication. Such regulation shall then be subject to clause (5) of paragraph (d).

"(f) All data submitted to the Administrator in support of a petition proposing the issuance of a regulation contemplated by this section shall be considered confidential by the Administrator and by an advisory committee and shall not be revealed to any person other than those authorized by the Administrator and by an advisory committee in the carrying out of their official duties under the provisions of paragraph (i) of this section.

"(g) Whenever the referral of a petition or proposal to an advisory committee is requested under this section, the Administrator shall forthwith appoint a committee of disinterested experts to review the petition and to make a report and recommendations thereon. The Committee shall be composed of experts, particularly qualified in the specific subject matter of the petition, selected by the Administrator, by the person filing the petition and by the Chairman of the Food Protection Committee of the National Research Council, the same number of experts to be selected by each. The members shall not be subject to any other provisions of law regarding the appointment and compensation of employees of the United States. Members of a committee shall receive as compensation for their services a reasonable per diem, which the Administrator shall by rules and regulations prescribe, for time actually spent in the work of the committee, and shall in addition be reimbursed for their necessary traveling and subsistence expenses while so serving away from their places of residence. The Administrator shall furnish the committee with adequate clerical and other assistance, and shall by rules and regulations prescribe the procedure to be followed by the committee.

"(h) The petitioner, if the proposed regulations were issued pursuant to a petition shall have the right to consult with such committee, as provided in subsection (g) of section 5, in connection with the petition or proposal.

"(i) Any person filing a petition under this section or filing objections under clause (5) of paragraph (d) of this section who will be adversely affected by any order under paragraphs (d), (e) or (f) of this section may appeal from such order by filing in the United States District Court for the District of Columbia, within sixty days after the entry of the order, a petition praying that the order be modified, amended or set aside in whole or in part. A copy of the petition shall be forthwith served upon the Administrator, or upon any officer designated by him for that purpose, and thereupon the Administrator shall certify and file in the court a transcript of the entire record including a copy of the Administrator's findings, conclusions and order, both proposed and final, including any objections, and replies filed thereto, any report or recommendations which may have been made by the Pesticides Advisory Committee together with copies of the original petition and supporting data upon which the case was heard and submitted to the Administrator. Such petition and transcript certified by the Administrator shall upon filing in the district court constitute the pleadings and the evidence upon which the trial shall proceed subject to the right of the court to allow the taking of such oral testimony which may be necessary and revelant to the pleadings and the evidence. Upon such filing, the court shall have exclusive jurisdiction to affirm or set aside the order complained of or to make findings of fact on the evidence with an order to the Administrator to modify or amend his order in conformity thereto, provided that the court shall consider and weigh the evidence before it de novo and no presumptive force or effect shall be given to the validity of the order complained of.

"If application is made to the court for leave to adduce additional evidence, the court may order such additional evidence to be taken before the Administrator and to be adduced upon the hearing in such manner and such terms and conditions as to the court may seem proper, if such evidence is material and there were reasonable grounds for failure to adduce such evidence in the proceeding before the Administrator. The Administrator may modify his findings as to the facts by reason of the additional evidence so taken, and he shall file with the court such modified findings. The judgment and decree of the court affirming, modifying or setting aside any such order of the Administrator shall be final, subject to review as provided in sections 1254 and 1291–1294 of title 28. The commencement of proceedings under this section shall not, unless specifically ordered by the court to the contrary, operate as a stay of the Administrator's order.

"(j) The Administrator may, upon the request of any person who has obtained an experimental permit for a pesticide under the Federal Insecticide, Fungicide and Rodenticide Act (7 U. S. C. 135) or upon his own initiative, establish a temporary tolerance for the pesticide for the uses covered by the permit whenever in his judgment such action is deemed necessary to protect the public health or may exempt such pesticide from a tolerance. In establishing such a tolerance, the Administrator shall give due regard to the necessity for experimental work in developing an adequate and wholesome food supply and to the limited hazard to the public health involved in such work when conducted in accordance with applicable regulations under the Federal Insecticide, Fungicide and Rodenticide Act.

"(k) (1) Regulations or proposed regulations affecting pesticides which are promulgated by the Administrator after the effective date of this section or within ninety days prior thereto under the authority of section 406 (a) and the procedure specified by section 701 (e) shall be deemed to be regulations under clause (5) or paragraph (d) of this section and shall be subject to all provisions of this section applicable thereto.

"(2) Regulations affecting pesticides which have become final before the effective date of this section under the authority of section 406 (a) and the procedure specified by section 701 (e) shall remain in

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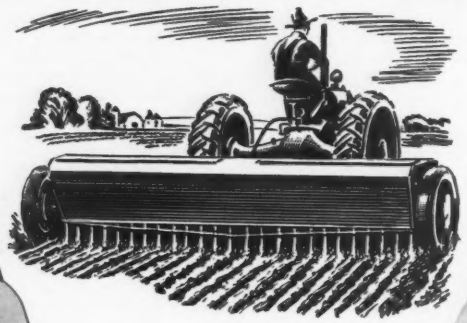

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full force and effect but shall be amended or repealed in the manner prescribed in this section and shall be otherwise subject thereto.

"**(l)** The Secretary of Agriculture shall, upon the request of any person submitting an application for the registration of a pesticide under the Federal Insecticide, Fungicide and Rodenticide Act or upon the request of the Administrator, certify to the Administrator whether or not the pesticide is useful for the purpose for which a tolerance or exemption is requested under this section. Such certification shall be made as soon as practicable after a request is made, but in no event later than thirty days thereafter.

"**(m)** The Administrator after due notice and opportunity for a public hearing is authorized to promulgate rules and regulations for the efficient administration and enforcement of this section. Such rules and regulations shall prescribe the manner in which regulations under this section may be amended or repealed."

Sec. 5. There is hereby authorized to be appropriated, out of any moneys in the Treasury not otherwise appropriated, such sums as may be necessary for the purpose and administration of this Act.

Sec. 6. All provisions of this Act shall take effect upon enactment. ◆

Complete Text of DELANEY Bill

BE it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 201 of the Federal Food, Drug and Cosmetic Act is amended by adding the following paragraph:

"**(q)** The term 'chemical additive' means any substance (including products resulting from changes in such substance after use) which:

1. is intended for use (A) as a food, or (B) to preserve or alter any food or any characteristic of any food or (C) as a pesticide or for any other purpose in producing, processing, packing, transporting, wrapping or holding food if such use is likely to result in the contamination of the food, and

2. is not generally recognized, among experts qualified by scientific training and experience to evaluate the safety of such substances, as having been adequately tested to show that it is not poisonous or deleterious, or is a poisonous or deleterious substance which is not generally recognized among such experts as having been adequately tested to show that it is safe for an intended use described in this paragraph."

Sec. 2. Section 407 of such Act shall hereafter be designated as section 408.

Sec. 3. Section 301 of such Act is amended by changing "404 or 505" in subsection (d) to "404, 407 or 505"; and "404, 505, 506, 507 or 704" in subsection (j) to "404, 407, 505, 506, 507 or 704."

Sec. 4. Section 304 of such Act is amended by changing "404 or 505" in subsections (a) and (d) to "404, 407 or 505."

Sec. 5. Section 402 (a) of such Act is amended by changing the period at the end to a semicolon and adding: "or (7) if it bears or contains any chemical additive, unless the use of such chemical additive in the quantity present in or on such food has been approved pursuant to section 407."

Sec. 6. The following section shall be added to chapter IV of such Act:

"**Sec. 407.** (a) No person shall introduce or deliver for introduction into interstate commerce any chemical additive, unless the use of such chemical additive has been approved pursuant to subsection (d) or (e).

"**(b)** Any person may file with the Administrator a request for the issuance of an order approving the use of a chemical additive. There shall be submitted to the Administrator as a part of the request:

1. reports of investigations which have been made to determine the acute and chronic toxicity and other potentiality for harm of the chemical additive;

2. a statement of the composition of the chemical additive;

3. a description of methods of analysis for the quantitative determination of the chemical additive in or on food, including animal or plant tissues if stored therein;

4. such samples of the chemical additive as the Administrator may require;

5. all directions, recommendations and suggestions proposed for the use of the chemical additive and

6. if the chemical additive is a poisonous or deleterious substance:

A. a statement showing that the chemical additive is required in the production of food;

B. reports of investigations which have been made to show the quantities of the chemical additive, if any, remaining in or on the food and

C. a description of adequate methods of removal of excessive quantities of the chemical additive in or on the food.

"**(c)** After the use of a chemical additive has been approved, the applicant may file a supplemental request setting forth any proposed change in the directions, recommendations and suggestions for the use of the chemical additive or in any other information in the original request.

"**(d)** Unless the Administrator issues a notice of hearing pursuant to subsection (e) prior to the sixtieth day after the date on which a request or supplemental request is filed, the request or supplemental request shall be deemed to have been approved on said sixtieth day for the uses specified; but the Administrator may issue an order approving the request or supplemental request at an earlier date or may postpone the date on which the request or supplemental request shall be deemed to have been approved until such time (not more than one hundred and eighty days after it has been filed) as the Administrator deems necessary to enable him to conduct the necessary study and investigation.

"**(e)** Unless a request or supplemental request is approved as provided in subsection (d), the Administrator shall give the applicant an opportunity for a hearing for the purpose of determining whether an order shall be issued approving the request or supplemental request. As soon as practicable after completion of the hearing, the Administrator shall notify the applicant of his action in approving or refusing to approve the request or supplemental request.

If the Administrator finds that

1. the investigations, reports of which are required to be submitted to him pursuant to subsection (b), do not include adequate tests by all methods reasonably applicable to show that the chemical additive is not poisonous or deleterious, or if it is, that it is safe and required for its intended use: or

2. the results of such tests show that the chemical additive is poisonous or deleterious, and that it is unsafe or not required for such use or do not show that it is safe and required for such use; or

3. the methods of analysis for the quantitative determination of such chemical additive in or on food, including animal and plant tissues if stored therein, or the methods of removal of excessive portions, are inaccurate or otherwise inadequate; or

4. he has insufficient information to determine whether the chemical additive is poisonous or deleterious, or if it is, whether it is safe and required for such use, he shall refuse to approve the request or supplemental request.

In determining whether to issue an order approving a request or supplemental request for the use of a chemical additive and the quantity of such chemical additive to be permitted in or on any food, the Administrator shall take into account the extent to which such substance is required in or on such food and the other ways in which the consumer may be affected by the same substance or other substances.

The Administrator shall make his order, and any order issued under subsection (f) only after a review of the whole record and in accordance with the reliable, probative and substantial evidence, and in any such order shall make detailed findings of the facts on which he based his order. Such orders shall be subject to judicial review in accordance with the provisions of section 701 (f).

"**(f)** After notice to the applicant and affording him an opportunity for a hearing, the Administrator may issue an order suspending the approval of a request or supplemental request with respect to a chemical additive if he finds that

1. experience in the use of the chemical additive, tests by new methods or tests by methods not deemed reasonably applicable when the request or supplemental request was approved, show that the chemical additive is unsafe for any use upon the basis of which the request or supplemental request was approved, or

2. the request or any supplemental request contains any untrue statement of a material fact.

The applicant may at any time thereafter request an order terminating the suspension and the Administrator, if reasonable grounds therefor are shown, shall make a prompt investigation and afford the applicant an opportunity for a hearing. The Administrator shall terminate the suspension if he finds that adequate measures have been taken to comply with and maintain the provisions of the request or supplemental request.

"**(g)** The Administrator shall promulgate regulations exempting from the operation of this section chemical additives intended solely for investigational use by experts qualified by scientific training and experience to investigate the safety of such chemical additives."

Sec. 7. This statute shall take effect six months after the date of its enactment. ◆

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No segregation, no hard cones:

Automatic Bin Filling With Conveyors

By R. W. Phillips
Chemical Engineering Service, Inc.

If you've been using a multiple set of conveyors to store fertilizer or other bulk material in your plant, this discussion of a shuttle system should be of interest.

The author, who designed the layout described and illustrated on these pages, says it can save farm chemicals manufacturers the big expense involved in using many conveyors and in constructing buildings 70 feet high to handle 20 feet of material, as frequently has been done in the past. In addition, Phillips claims, his system is easily adaptable for plant expansion.

CONVENTIONAL storage systems present a multitude of problems to most fertilizer mixers. If your unit necessitates dumping constantly on a fixed point, segregation occurs as a matter of course and hard cones frequently are formed where the dumping takes place.

With a fixed system, when the peaks or cones get too high, a man has to jump in to level the pile before more dumping can take place. There are lots of other storage problems that can cut down considerably on your margin of profit.

About a year ago I developed a new building and conveyor system especially adapted to the bulk storage of chemicals.

Initial construction costs are greatly reduced because fewer conveyors are used, all overhead structure is eliminated and less steel is needed.

Only three conveyors are needed in most situations. Here's how the system works:

1. A fixed conveyor (A in the illustrations) delivers fertilizer from the bucket elevator or unloading point, dropping the material on conveyor B;

2. Conveyor B, located in the center of the building, rides up and down the length of the structure on a conveyor frame, dropping the fertilizer on a cross shuttle conveyor C;

3. The third conveyor operates laterally, making final drops of fertilizer into the appropriate storage bin. This conveyor travels the length of the building on rails. It is set up to receive material from conveyor B anywhere along its line.

By manipulating the location of the center and shuttle conveyors an operator can make delivery of fertilizer to any point in a matter of minutes.

Most of the inherent disadvantages of the fixed systems are eliminated in this design. By frequently moving either cross shuttle, carrier, or both, segregation can be eliminated by never discharging more than a few tons in one location. In addition hard cones are not built up by constant dropping in one place.

Complete Filling, No Peaks

Complete filling of building and bins is obtained without peaks and without use of manpower in leveling bins. Because the conveyor discharge is not fixed bins located anywhere in the building can be filled and their arrangement can be changed without alterations in the conveyor system.

Faster cooling of material going into the pile will result because the heat has a chance to dissipate before the fertilizer is smothered by other batches being discharged onto it.

The system reduces necessary building height and eliminates need for overhead work space and costly monitors.

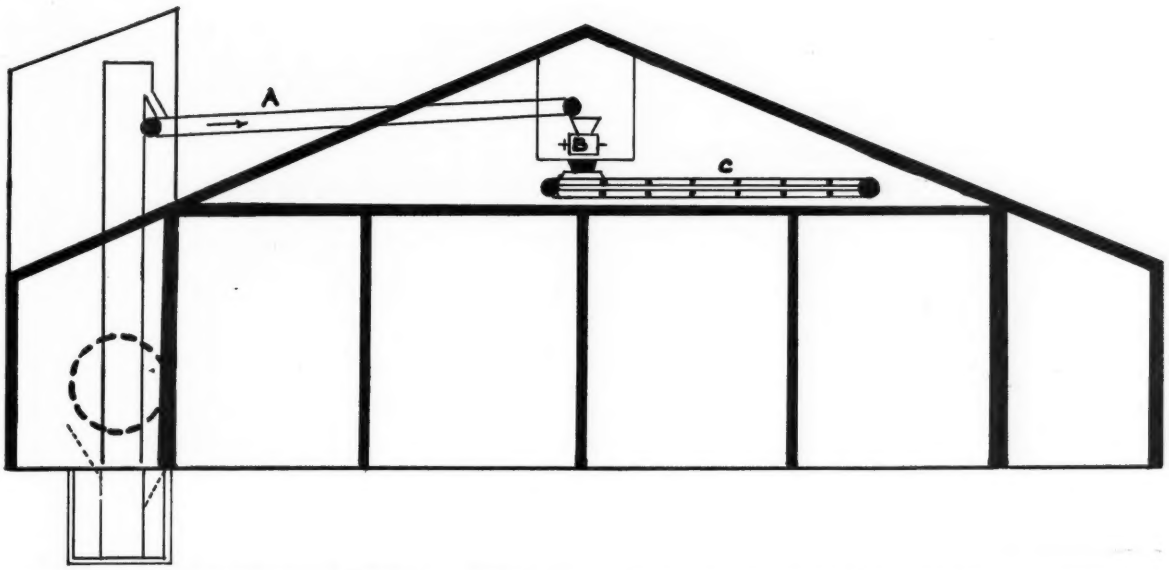
For example, if the storage area in a building is 100 feet wide and equipped with a center conveyor only, material discharged from the conveyor would assume an angle of repose of approximately 45°. The resultant high peak would necessitate trimming the balance placed in the area.

To obtain complete filling of such an area, with a storage depth of 20 feet, without trimming, a single center conveyor would have to be 70 feet above the floor, a most impractical and costly arrangement.

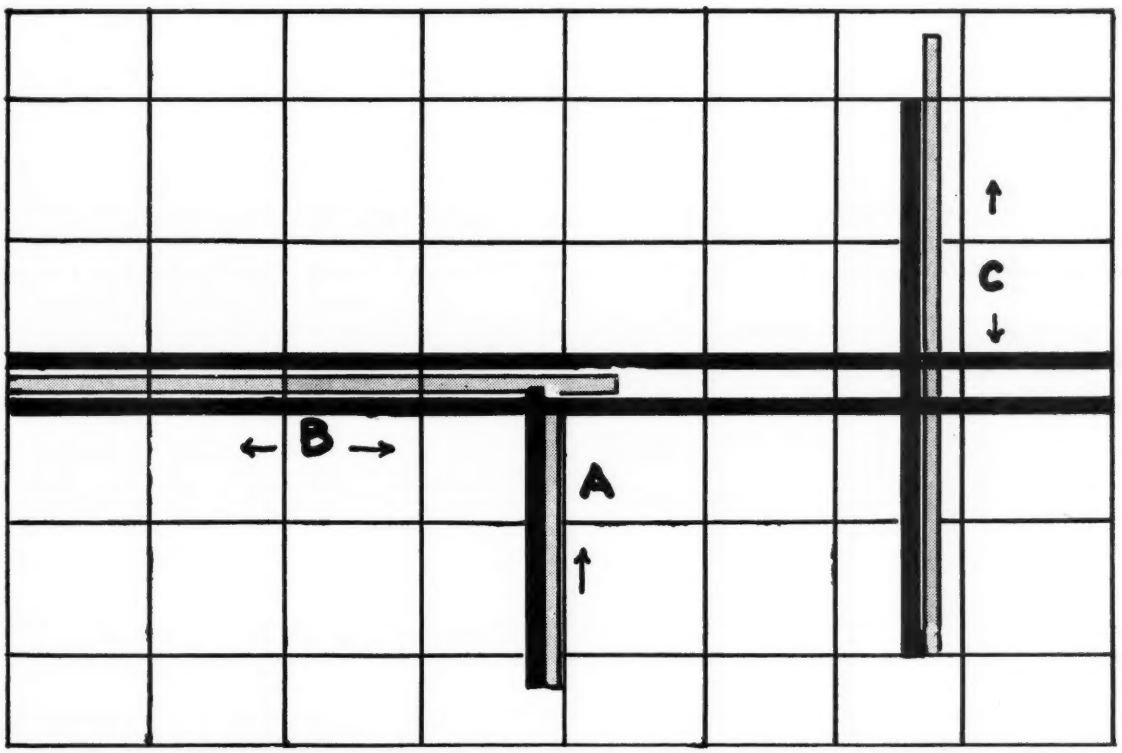
In the past, as an alternative, multiple conveyors have been installed, two or more according to the building width. Again this is very costly and, unless the conveyors are close together, still allows peaks and valleys in the bins and does not solve the problem of segregation.

Setup Easily Adaptable

With the new system, as explained, such measures are not necessary. In case of building expansion it is



SIDE VIEW OF BIN FILLING SYSTEM: Fertilizer material is elevated from mixer at lower left to conveyor A. It is transported to catch hopper and deposited on shuttle conveyor B. Second shuttle conveyor, C, moves from side to side in the building, making final deliveries of material to exact location desired in plant.



TOP VIEW OF BIN FILLING SYSTEM: Stationary conveyor A takes material from mixer to center of storage area, dropping it on shuttle conveyor B which moves it from one end of building to other. Shuttle conveyor C is moved into place below B, and material is transferred to it. Conveyor C makes final lateral delivery to bin.

necessary only to lengthen the center shuttle conveyor according to the additional space constructed. This would entail very little expense, and the cross conveyor would require no changes.

If storage bins are separated by aisleways, filling still is relatively simple because the cross conveyor can be moved over into position to span the aisle. Other systems would require a complete separate conveyor unit for filling.

We have also developed quick opening fronts for the storage bins, retaining the advantages of open book shelf construction but including other features as well.

Boards are set at a down angle on the inside of the bin. Thus pressure of the material is down rather than out. Lower boards can be removed as desired to per-

mit access to the bins without the annoyance of having an entire pile flowing out into the aisle.

Shelves can be spaced at wider intervals than usual without spillage because the material will flow on an angle of approximately 45° counter to the bookshelf. They can be spaced as far as eight inches apart requiring only half as much lumber as the usual bin front of this type.

Angle Can Be Varied

The angle can be changed according to the material stored so that a very free flowing product can be held within the bin merely by increasing the angle of the shelf to a steeper inward slant.

The system is best adapted, of course, to front and rear partitions where there are no adjacent material, since it will prevent flow in only one direction.

For intermediate partitions a double or inverted V is required and can be provided while still retaining the advantages of quick changing and ready access to the bins. Lumber costs however are not reduced since the wider spacing is not permitted.

Bins Easily Accessible

These would cost more than the conventional type of partitions and would have to be weighed carefully against the value of their flexibility. Conventional bookshelves can be used by laying in the customary horizontal position and spot welding the angles horizontally to the column with clips on both ends to retain the flexibility and easy removal factors.

We feel that both of these innovations will result in a considerable savings to fertilizer mixers through reduction in installation costs and manpower required once in operation. ◆

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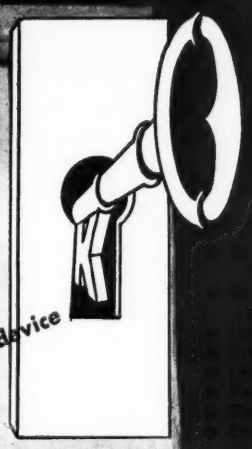

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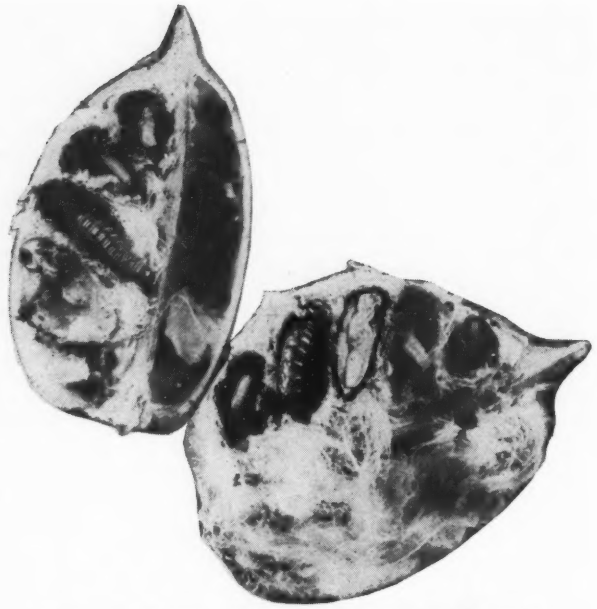
Pink Bollworm —
It's fast becoming

Cotton Enemy Number 1.



Close-up of green cotton bolls opened with seeds sectioned to reveal larvae of the pink bollworm.

MEMBERS of the pesticide industry were made forcefully aware recently of a new insect foe that threatens to take a big toll of the cotton crop this year unless something is done about it.

And cotton farmers, with their guard down after last summer's light insect infestations may not be fully aware of the menace and the damage it can do until it's too late.

The pest is the pink bollworm. Actually it's not new, having entered the United States in 1917. But by means of survey, quarantine, research and the vigilance of growers and processors, it had been kept in check until recently.

Bad Weather Blamed

The USDA blames bad weather at the close of the 1951 season for the present danger. The weather kept many growers out of their cotton fields after harvest and prevented them from cutting stalks and plowing them under to retard a build up of the pink bollworm.

"The most serious threat since the appearance of the boll weevil" is the way Avery S. Hoyt described the pink bollworm at the recent meeting of the National Agricultural Chemicals Association in New Orleans.

Hoyt, chief of the Bureau of Entomology and Plant Quarantine, said the insect "always has turned out to be the worst cotton insect everywhere it has become established."

Hoyt said the pest now occupies the greatest acreage ever infested in the country.

"Continued spread of the pink bollworm," he added, "plus an inadequate knowledge of its biology, habits, ecology and other factors the entomologist must have to determine the best means of control, make this problem one of the most important facing the Bureau today."

The problem is serious and the job of the pesticide industry in seeking a solution to it is clear, according to agricultural leaders. Industry must provide research and intensive experimentation to find an answer to the pink bollworm.

Avery S. Hoyt

Systemics Fail

Failure with one method—use of systemic pesticides to control the pink bollworm—was indicated in another report made at the convention by Dr. H. G. Johnston, head of the research and development unit of the National Cotton Council. (See page 35).

"Systemics do not look very promising for control of this pest," Dr. Johnston said in reviewing extensive experimentation by the BEPQ last year with systemics.

In tests with six of the more promising systemics, he stated, "results were disappointing and none of the compounds gave satisfactory control even at this extremely high rate of application." (as sprays at two pounds per acre).

While insecticidal chemicals eventually may provide the answer to the scourge of this cotton pest, they are only part of any control program, according to Hoyt. Also of importance, he said, is the old and inexpensive method of cultural control. But that method requires community effort, he added, and concerted effort is hard to obtain.

In the line of cultural control, USDA considers the menace of the

pink bollworm so important it has an entomological explorer in India seeking natural enemies of the insect.

The Department reports that several already have been found. First shipment of the parasites is under study now in the Bureau of Entomology parasite laboratory at Moorestown, N. J.

Meanwhile, at Texas Agricultural Experiment Station, research workers have been growing pink bollworms through the entire life cycle with a modified chick diet high in fatty acids.

Food Requirements

Object of this research is to determine essential food requirements of the bug with an idea toward breeding cotton that won't satisfy those needs.

Lots of other information about the makeup of the insect will be needed before any real progress can be made against the cotton foe. And even after potent pesticides are developed to combat it, the problem won't be finished.

"Suppose," said Hoyt, "research entomologists find an effective, inexpensive insecticidal program that will serve the purpose of the cotton farmer? The question immediately comes to mind—will the insects develop resistance to the chemicals, and how soon?"

The resistance problem has assumed more and more importance in the past few years. So much so that the Bureau of Entomology head termed it "the modern entomological headache."

"It isn't only the housefly that worries us," he declared.

Other Problems

"It's the codling moth problem, the Colorado potato beetle problem and others that could materially affect our food and feed supplies. These problems now making themselves felt have entomologists worrying about future growing seasons and what they may bring. New reports of harder-to-kill insects are reaching us with increasing frequency.

"We don't know just how long present insecticidal controls, most of them still remarkably effective, will continue to help farmers give this nation the bumper crops of food, feed and fiber so necessary to the present high standard of living.

What's the Answer?

"Will the answer to the resistance problem be even newer, more effective insecticides? The entomologist, the insecticide chemist and the manufacturer are all together on the same road. None of us has the answer now."

The pink bollworm, of course, isn't the only problem confronting the Bureau of Entomology and the pesticide industry.

On the subject of grassland farming Hoyt brought out these provoking points at the NAC meeting:

"We talk about a grassland agriculture. Aside from grasshoppers, we know very little about the insects that infest and destroy grasses. This is nearly an unexplored research field involving millions of acres. It is an almost untapped field so far as insecticidal applications are concerned.

"The insects that damage and destroy crops from below the surface of the soil may be among the most important of all insect problems from the standpoint of increased crop production. This major line of investigation may very probably be the entomological frontier of our times.

"Millions upon millions of acres are involved. Cutworms, wireworms, white grubs, rootworms and others beyond our present comprehension await our study. Relatively few acres are being treated with insecticides today.

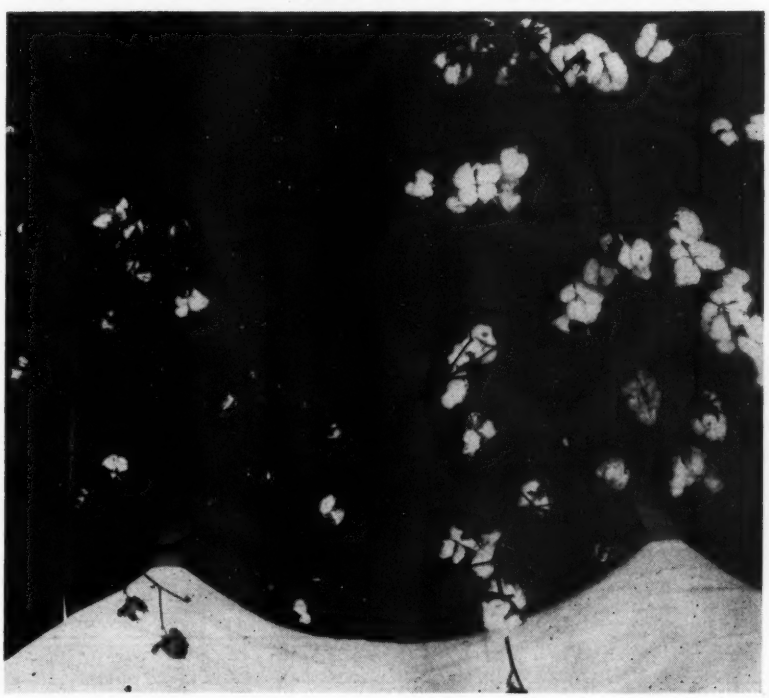
Only Preparatory

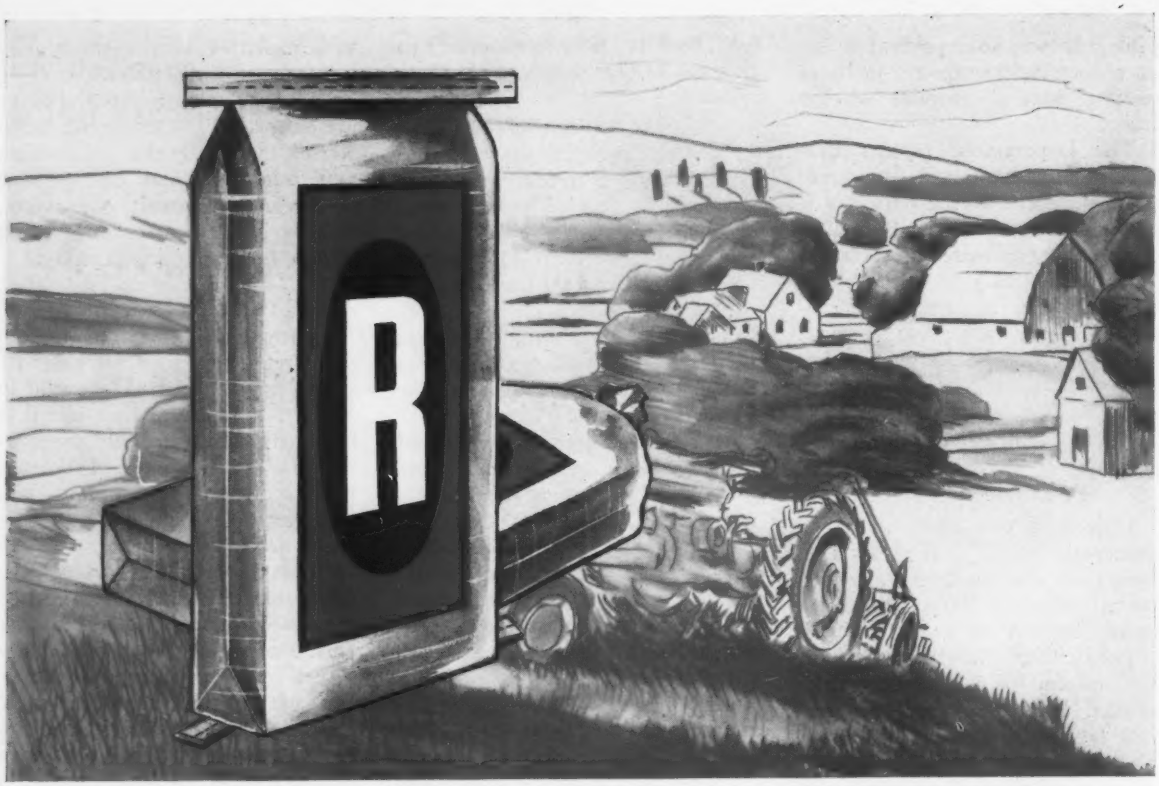
"Entomological work in the federal government soon will enter its second century. It will be said in history, I am sure, that our first hundred years were only preparatory for the second. I do not think entomology is more than launched so far. Our major successes are yet to come.

"Insect control must always take insecticidal chemicals into consideration. I do not doubt that such chemicals will usually be the entomologist's first line of defense. The fields of entomological research and the insecticide industry have come a long way in the past few years.

"I am confident that the teaming of these two great fields will give American agriculture greater production and greater prosperity in the future than in the past. ◆

Costly damage that the pink bollworm can do is illustrated graphically in this picture of exposed (left) and unexposed cotton plants.





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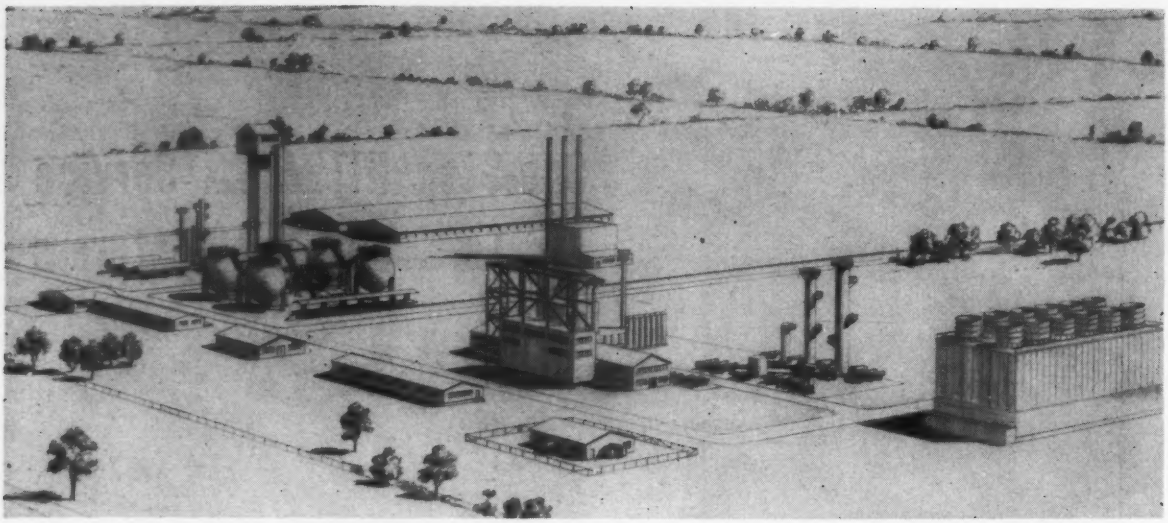


It won't be completed until the summer of 1954, but here's how the new Grace Chemical Co. plant will look when it is completed. The $19,000,000 structure is under construction on a 277-acre site near Memphis, Tenn.

More N for agriculture:

Grace Starts Building Big Nitrogen Plant

GRACE CHEMICAL CO's impressive entrance into the farm chemicals field is in full swing this month.

The company was formed late in 1952 by W. R. Grace & Co., parent organization, with plans to build a large urea plant near Memphis.

Exact nature of those plans were announced in April by William P. Gage, president of the company.

The company's $19,000,000 nitrogen plant, to be constructed on a 277-acre site six miles from Memphis, Tenn., is expected to be completed by the summer of 1954, with a daily capacity of 250 tons of nitrogen products.

Foster Wheeler In Charge

In charge of engineering and construction for Grace is Foster Wheeler Corp. Three key processes to be utilized in the plant are the Texaco Partial Oxidation, Casale and Pechiney.

Construction of the mammouth plant was scheduled to start this month.

One of the big links in Grace's complex nitrogen plant will be an air separation plant designed by Air Products Incorporated to provide pure oxygen and nitrogen.

Here's what the three processes will be designed to do:

The **Texaco Partial Oxidation** process will be used to manufacture synthesis gas;

Casale Ammonia process will provide ammonia and

The **Pechiney** process will be used for the manufacture of urea by use of by-product carbon dioxide and ammonia from the Casale unit.

Nitrogen For Farm Use

A big portion of the total output at the Memphis plant will go to agricultural uses. Gage told FARM CHEMICALS approximately 125 tons of the daily capacity (or half the total) would go to providing agricultural nitrogen.

Remainder of the material will be used for industrial chemicals.

Gage joined the young member of the fertilizer industry early this year, coming from Shell Chemical Corp., where he was vice president.

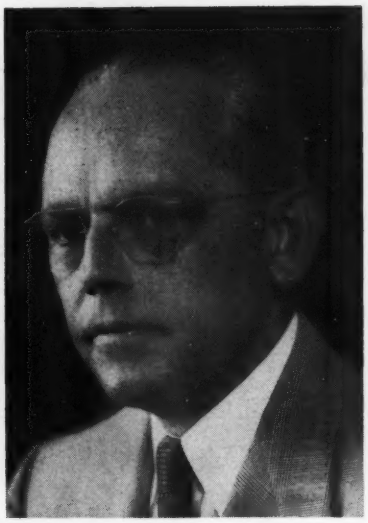
At Grace he is a director of the company in addition to being president.

Plant manager for the Memphis unit is John Carriere, former manager of the Engineering and Construction Division of the Atomic Energy Commission's Hanford Works.

Prominent business leaders included on Grace

Chemical Co.'s board of directors are Robert T. Haslam, former vice president and director of Standard Oil Co. (New Jersey) and president of United States Pipe Line Co.; Charles E. Wilson, former president of General Electric Co. and chairman of the board of directors of W. R. Grace & Co., parent corporation; Bradley Dewey, chairman of the board of Dewey and Almy Chemical Co. and wartime director of U. S. Rubber and Edwin R. Gilliland, professor of chemical engineering at Massachusetts Institute of Technology.

William P. Gage



John G. Carriere

World's Largest Generator

When the Memphis plant is completed and equipped it will boast the world's largest high-oxygen generator —the installation being done by Air Products, Inc.

According to the company, located in Emmaus, Pa., the generator, as big as a three-story house, will produce more than 200 tons of oxygen and 300 tons of nitrogen daily. The unit will cost Grace approximately a million dollars.

It will enable the company to produce ammonia by a new low-cost process of partial oxidation of natural gas, Air Products states.

The low cost process is the one being installed by Texaco Development Corp., subsidiary of the Texas Co. It is unique in many ways.

Partial Oxidation Process

It uses natural gas and oxygen, partially burning these at intermediate pressure and high temperature to obtain a mixture of hydrogen and carbon monoxide. In order for Grace Chemical to employ this process, an air separation plant is essential.

The plant will separate incoming air into pure fractions of nitrogen and oxygen and an impure nitrogen stream. Oxygen obtained from the unit then is mixed with compressed natural gas in the Texaco Partial Oxidation unit to produce the synthesis gas.

High Temperature and Pressure

Temperature of operation for the generators will be in excess of 2000° F at a pressure greater than 300 pounds per square inch.

The Casale Ammonia System, of which Foster-Wheeler Corporation is the American licensor, is unique in that it uses an ejector for the recirculation of non-converted gases, rather than the more common compressor.

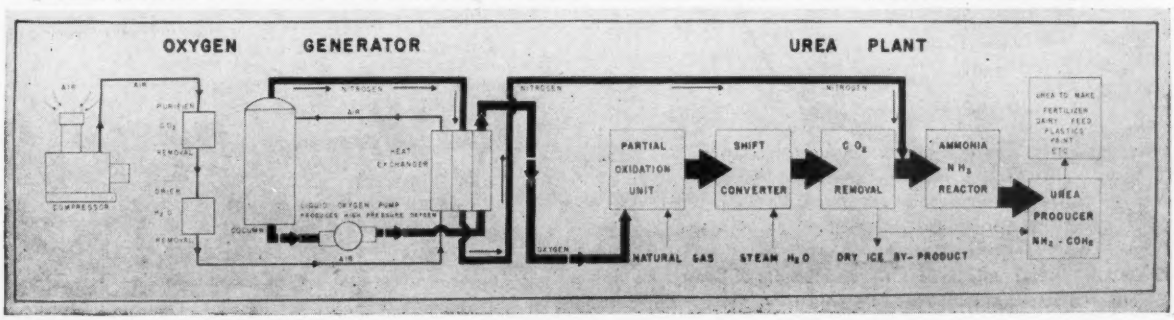
Otherwise, the system is quite similar to the standard ammonia process. One of the great advantages gained by the use of high pressure in the synthesis is that ammonia condensation can be brought about at the usual cooling water temperatures rather than the low temperatures obtained by ammonia refrigeration.

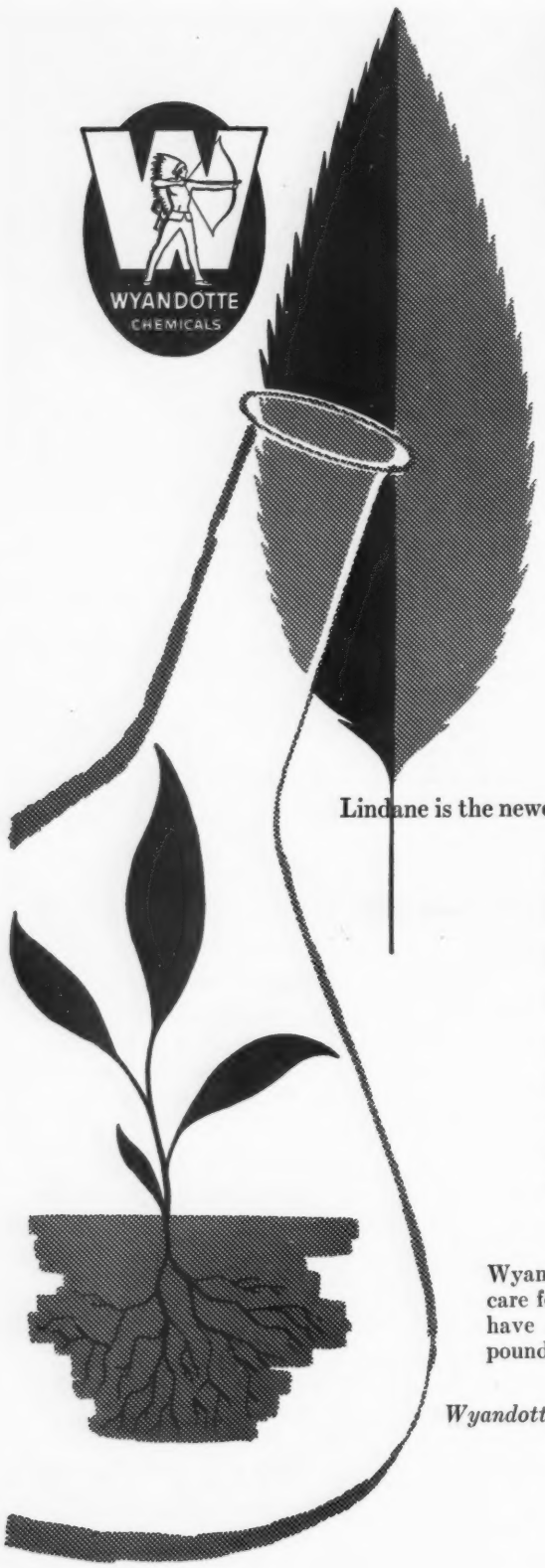
Carbon Dioxide and Ammonia Used

The urea plant uses purified carbon dioxide and ammonia as raw materials. The purified carbon dioxide is obtained in the raw form from the monoethanolamine stripper and is then compressed and purified to remove traces of sulfur and oxygen. Individual feed streams are pre-heated, then forced into a high pressure autoclave to which a recycle ammonium carbamate-oil slurry also is added.

Other officers of Grace Chemical Co. include Harold S. King, controller; C. J. Brown, manager of sales development and E. E. Winne, an assistant vice president, in charge of development department. ◆

Flow diagram shows all the chemical processes involved in the new Grace nitrogen plant. Involved are three important processes: the Texaco Partial Oxidation, Casale Ammonia and the Pechiney process for making urea.





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Not a cure-all but . . .

Systemics Have A Bright Future

By Dr. H. G. Johnston

Head, Research & Development Unit
National Cotton Council

A TREMENDOUS interest has developed during recent years in systemic insecticides. Following the discovery that certain phosphorus compounds when applied to the leaves or roots of living plants were absorbed and translocated in sufficient quantities to kill certain insects, a whole new field of insecticidal research has developed.

It was obvious immediately that such compounds would have distinct advantages over conventional insecticides. Loss or decomposition from exposure to sun, rain, dew and wind would be eliminated. It would be unnecessary to make repeated applications to cover new foliage, fruit and stems developed as a result of rapid plant growth.

Other Benefits

Perhaps the most promising possibility would be the protection of beneficial insects. If systemics could be applied successfully to the soil or as seed treatments there would be no hazard involved for parasites and predators that do not feed on the treated plant. Some of the systemics developed to date have little or no contact toxicity when applied as sprays and are effective only after being absorbed into the plant. These are not destructive to beneficial insects.

This article is based on a talk given by Dr. Johnston at the recent National Agricultural Chemicals Association meeting in New Orleans, March 11–13.

Dr. H. G. Johnston

Others that have a strong contact action as well as systemic action are highly destructive to beneficial insects when applied but this effect is relatively short when compared to the residual effectiveness of the absorbed chemical.

Old Idea

The idea of introducing chemicals into the sap-stream of plants to kill insects is by no means a new one. However, the development of highly toxic phosphorus compounds has created many variations of an old one. It has been known for many years that plants sprayed with bordeaux mixture may absorb enough of the copper in the spray to kill certain sap-feeding insects. The sap of dying trees may be poisoned with zinc chloride or copper sulfate to kill bark beetles feeding in the tree and prevent spread to other trees.

Selenium compounds have been known for a long time to be outstanding among the inorganic chemicals for their ability to be absorbed and translocated by plants. Sodium selenate is absorbed by the roots of many plants and serves as an effective systemic insecticide for aphids and spider mites. The extremely high toxicity to higher animals and its persistence in plants and soils restricted its use primarily to ornamental plants in greenhouses. Even here the disposal of treated potting soils was a major problem.

Increased Interest

The tremendous development of phosphorus compounds before and after World War II has brought about an increased interest and much greater inportance to the study of chemical absorption and translocation by plants.

Although much has been accomplished in this area during the last four years, a great amount of research must yet be done to determine the possibilities and limitations of systemic insecticides. Perhaps a considerable part of this re-

search should be in plant physiology.

A systemic insecticide must be readily absorbed either through the root or leaf cuticle in sufficient quantities to kill destructive insects and not injure the plant. It must be sufficiently stable within the plant to provide prolonged residual protection.

There is evidence that the plant plays an important part in the action of some systemics by slowly converting the chemical into some other substance which kills the insect. Such compounds recently have been termed endo-metatoxic systemics.

Schradan (octamethyl pyrophosphoramide) is one of this group. This insecticide has no contact action at the time it is applied to the insect and shows little or no effect upon the cholinesterase system. However, the sap of plants is highly toxic to aphids and spider mites two or three days after schradan has been applied to the plants.

Mode of Action

The sap of treated plants is highly effective in inhibiting the function of cholinesterase in insects which feed upon it. This indicates that the mode of action is the same as other phosphorus compounds after it has been changed in some way by the plant.

A study of phosphorus compounds which act in this way indicates that there is a high energy bond, or a potential site for enzymatic association in that portion of the molecule joined to phosphorus by an anhydride linkage.

Seven different types of potential enzyme association sites have been found thus far to confer systemic activity to a compound. In each of these seven types only a small number of the many compounds that could be synthesized have been studied. The most promising phase of this area of research is that entirely different types of enzyme association sites are still being discovered. Two of the seven types now known were announced this year (*Allen and others, Wisconsin*).

The future of systemic insecticides is dependent largely upon developments in the fields of biochemistry and insect physiology. Both are relatively new fields but are expanding rapidly. The comparatively few discoveries to date concerning systemics are perhaps of less immediate importance than the basic leads they provide for future research.

To exploit these leads, particularly with regard to the mode of action upon the insect, is important not only with regard to systemic insecticides but all other insecticides as well.

Similar to Man

A better understanding of the physiology of insects including the specific reactions of all the chemical changes taking place in the body of living insects probably would lead to the development of more effective and less hazardous insecticides. It is well known that a living insect performs most if not all the physiological functions that are performed by the bodies of higher animals including man.

Although these functions are accomplished in insects by organs and processes that are considerably different from similar functions in higher animals, it seems that the fundamental biochemical reactions occurring in the individual cells of the two groups are quite similar. Because the use of insecticides is intended to inhibit or destroy these fundamental chemical reactions within the cells of the insect body, it is really a difficult task to obtain an effective insecticidal compound that is not also toxic in some degree to higher animals.

Certain combinations of circumstances, however, often make chemicals much more toxic to insects than to higher animals. The small size of insects and the comparative thinness of the cuticle leaves their nervous system poorly protected from insecticides. Furthermore, practically all of the sense organs of insects are simply extensions of nerve endings on the surface of the body and are especially vulnerable to the attack of insecticides.

Even though the toxic action of insecticides is much the same on insects and higher animals there is a considerable difference in the degree of toxicity. Consequently it is possible to obtain insecticides which are highly toxic to many insects but which have a low degree of toxicity to higher animals.

Research Needed

Because a few chemicals are available that are highly effective for insect control and non-toxic or nearly so, for higher animals, it is logical to assume that the combined research of the physiologist, biochemist and entomologist should produce others that even more nearly approach this ideal.

A better understanding of how insecticides kill, or the mode of action, is essential for a more intelligent development of systemics or any other new insecticides.

Dr. Ivy in cooperation with chemical manufacturers has screened hundreds of compounds for systemic activity for cotton insects. Many of these have shown systemic action but most of them have the same limitation so far as cotton insect control is concerned; they do not kill the boll weevil or the pink bollworm.

Systox (ethyl mercapto ethyl diethyl thiophosphate) has been more extensively tested than any of the other systemics to date and now is available for commercial use. This chemical was used rather extensively last year for spider mite control in the western cotton growing areas.

One application at the rate of one-fourth to one-half pound per acre, applied as a spray controlled mites through the remainder of the season. This is a remarkable accomplishment in an area where spider mites are notoriously difficult to control. It is also highly effective for aphid control for several weeks. Systox will kill thrips and leafworms by contact action but has no residual toxicity or systemic action against these pests.

Other facts about Systox, manufactured by Pittsburgh Agricultural Chemical Co., are contained in two previous articles appearing in FARM CHEMICALS. *The first, announcing approval of the systemic, was in the June, 1952, page 12. Another, on its use in nematode control, appeared in the November, 1952 issue, page 12.*

Schradan has been used commercially to some extent for ornamental plants but no label has been granted for use on cotton in this country. It is highly effective for aphids and spider mites for four to six weeks when applied to seed at the rate of one pound per 100 pounds of seed. Higher dosages reduced germination. A single spray application of one pound per acre controlled aphids and spider mites for two to four weeks.

Schradan and Systox

It has no effect, however, for two or three days after application because the chemical must be converted within the plant to a toxic substance. Laboratory tests indicate that two to four times as much schradan would be required for effective control as for systox.

Any insecticide to be of most value in cotton insect control must be effective for the boll weevil. Much time has been spent searching for an insecticide that would control boll weevils by systemic action. At least a half dozen compounds have been found that will kill boll weevils in this way.

Most of the systemics which kill boll weevils are not converted by the plant, as in the case of schradan, but act as unchanged chemicals. As a result most of these compounds are not translocated following application to the foliage. They may be translocated through the roots following soil application or when applied to the seed before the time of planting. A second difficulty is that most of them tend to inhibit germination or injure the seedling plant when used as a seed treatment at dosages high enough to kill boll weevils.

One compound recently has been found which looks promising for boll weevil control when used as a seed treatment. This is a compound synthesized by Gerhard Schrader and designated L-11-6.

Laboratory tests indicate a complete absence of plant toxicity or reduction of germination when seeds are treated with as much as 16 pounds per 100 pounds of seed. It is indicated that four pounds of the chemical per 100 pounds of seed, or approximately one pound per acre, may be an effective dosage. Thus there is a fair margin of safety so far as plant toxicity is concerned.

Kills Boll Weevils

Laboratory studies indicate that this compound will kill boll weevils on plants grown from treated seed for approximately six weeks after germination. Thrips, aphids, spider mites, fleahoppers and several other cotton pests also are controlled by such treatment.

It is obvious that L-11-6 or some similar compound might have a very important place in the early season program for cotton insects. The successful use of a seed treatment for control during this season probably would eliminate one of the most serious difficulties which may result from the present schedule of early season applications. That is the destruction of beneficial insects which may allow the development of increased bollworm populations later in the season.

Such a development would make possible the treatment of all planting seed which would greatly increase the advantage now obtained from community-wide early season control programs. At this point, however, it should be emphasized that tests with this material still are in the laboratory stage. Extensive field tests are needed to determine if it may be effective in a practical control schedule.

A major problem still to be determined is the possibility of poisonous residues at harvest time. Tests have shown that L-11-6 loses its effectiveness for insect control about the time the plant starts blooming. This would indicate that no residue problem would be involved but additional data will be required.

High Toxicity

It is reported that L-11-6 is highly toxic to higher animals and the manufacturer has no plans at this time for developing this compound commercially. Instead it is concentrating on the development of analogs that may combine the insecticidal efficiency of L-11-6 with low mammalian toxicity. This development is an important illustration of some of the promising leads which recently have come out of systemic insecticide research.

No basic research program for cotton insect control is complete without giving consideration to pink bollworm control. Last year BEPQ placed considerable emphasis on screening systemics against this pest. Eighty-six of the most promising compounds were tested in the laboratory. Of this number 18 showed some degree of promise at a dosage of 64 parts per million parts of green cotton boll. Only three of these killed at concentrations as low as four parts per million. The better systemics, however, used for aphid and spider mite control give similar kills at one part per million or less.

In preliminary field tests for pink bollworm control, six of the more promising systemics were applied as sprays at two pounds per acre, which is considered to be about the top dosage that would be economically feasible. The results were very disappointing.

For other information on the pink bollworm—"the worst cotton insect"—turn to the extract of the talk by Avery S. Hoyt, Chief of the BEPQ, which appears on page 28.

None of the compounds gave satisfactory control even at this extremely high rate of application. Other tests showed that neither seed treatment nor soil applications as high as 16 pounds of insecticide per acre were effective for pink bollworm control. From these tests systemics do not look very promising for control of this pest. However, many other compounds are available for testing and some of these may prove to be effective.

It is obvious that a tremendous amount of research is needed to explore properly the total possibilities of systemic insecticides. Some of the recent developments look very promising and may have far-reaching results in the future development of this area of research.

There is no evidence, however, to indicate that systemics will ever be the answer to all our problems or that this type of insecticide is likely to replace all others. It is entirely possible that some of these compounds may prove to be highly effective for certain purposes and perhaps overcome some of the difficulties inherent in other types of insecticides. ◆

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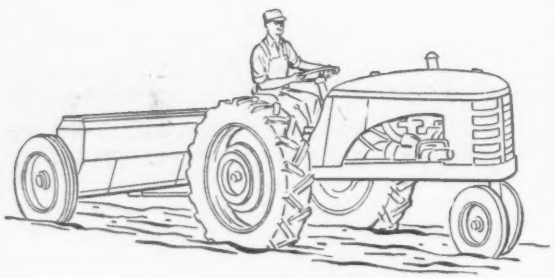

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To Tennessee farmers . . .

They're Boosting High Analysis Fertilizers

PROBABLY the greatest single contribution the Tennessee Farmers Cooperative has made to farming in the state has been the production of high analysis fertilizers.

That at least, is the opinion expressed by J. B. Jones, general manager of the corporation, and many of its members.

Like the U. S. Department of Agriculture and many other members of the farm chemicals industry, TFC has stressed the economy and efficiency of using high analysis plant food mixtures.

High Analysis Fertilizer

Early in 1949 TFC was responsible for bringing the first high analysis fertilizer into the state, it claims, and since has advocated, through extensive educational campaigns, its use.

The co-op didn't stop there. It used a great portion of the facilities of both its plants for improving the mixes.

According to William M. Pease, who handles advertising for the organization, "responsible persons in the state university and extension service have stated time and time again that the strides Tennessee Farmers Cooperative have made in getting the farmers to swing to high analysis fertilizer materials have been worth the money which has gone into the organization if it had accomplished nothing else."

Fortunately, however, for the farmers of Tennessee, TFC has accomplished many other things.

But, like most of the companies reviewed thus far in this special FARM CHEMICALS series on industry plants, the organization had a modest start.

Co-op Started in 1946

That start was made back in 1946, when the TFC was founded by several members of the Tennessee Farm Bureau Federation.

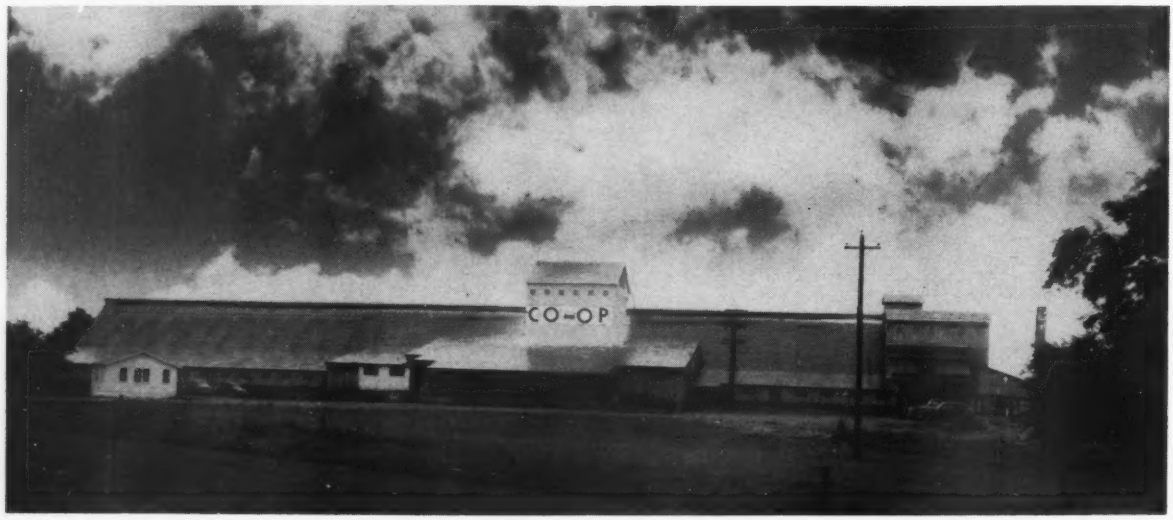
As Pease explained it, "the organization has operated independently of the Farm Bureau but still maintains a close 'cousin' relationship."

TFC was capitalized at $33,000 and incorporated in 1946, with main offices in Columbia. (It has since been moved to Nashville.)

At that time three warehouses, located at Jackson, Nashville and Knoxville served the county cooperatives in the three geographical regions of the state.

Biggest moment in TFC's existence came in 1950

View of the first plant constructed by Tennessee Farmers Cooperative in 1950 near Nashville, Tenn., to serve farmers in central portion of the state. The unit cost $250,000. A similar fertilizer plant at Knoxville followed a year later.



when the first cooperatively owned and operated fertilizer plant in Tennessee was built at LaVergne (near Nashville) at a cost of $250,000.

Financing of the structure was attained by the sale of preferred stock in the organization.

Second big step in the organization's growth was made a year later when construction of an identical plant was begun at Knoxville. The second plant was completed and put in operation last August.

Planning Third Plant

Not content with units in two of the three sections of Tennessee, TFC now is planning to erect a third fertilizer plant at Jackson.

While all this physical expansion was going on the co-op was busy with several other projects of importance to the agriculture of the state.

Projects like bringing to the state the first turnip-free crimson clover and installing a magnetic seed-cleaning machine (said to be the only one in the southeastern portion of the country.)

Tom Hitch, president of TFC, shown unveiling dedicatory plaque during ceremonies connected with opening plant at La Vergne, near Nashville.

But, as the co-op justly boasts, introduction of high analysis fertilizers has been its chief accomplishment in its comparatively short period of seven years in the farm chemicals field.

In a folder distributed to farmers in the state, TFC sets forth three main advantages of high analysis mixes: savings in initial cost, freight charges and labor.

When you buy fertilizer of this type, it explains, you don't pay for filler and you get units of plant food at a lower cost than is the case with lower analysis mixtures.

Reduced Shipping Costs

Farmers also save in reduced shipping costs because they don't pay for transporting filler. Further, the folder asserts, labor costs are spared with the reduced time needed to load, haul and spread what it calls "useless fillers."

Telling farmers of the advantages of using high analysis fertilizer isn't the only educational job the corporation has done. Also of merit are its intensive demonstration programs to show the benefits of adequate fertilization, proper spacing of plants and wise development of pasture lands.

Since its first few months of business, trends at TFC have been steadily upward. Trends in savings, distribution of supplies, and purchases of stock, feed and fertilizers.

Figures for 1951 and 1947 (first complete year of operations) show these big increases: for savings, $197,500 compared with $25,200; distribution of supplies, $7,410,251 to $1,256,500; stock, $450,600 to $47,100; fertilizer purchased, 65,000 tons to 19,500 and feed purchased, 25,800 tons to 1,500.

One reason for the success of the organization, in addition to the enthusiasm of its members, may be found in the modern construction of its first two plants. Of A-frame construction, they are 410 feet long and 100 feet wide, with facilities for manufacturing superphosphate as well as any analysis of mixed fertilizer materials. Capacity of the plants is 30,000 tons a year.

The cooperative employs 42 persons in its operations, which serve 70 member counties and 16 nonmember counties in the state.

Officers of the corporation include, in addition to General Manager Jones, F. V. Browder, president, Walter Gernt, vice president and F. B. Watson, secretary-treasurer.

Basic Co-op Principles

Basic principles of the co-op include open membership, democratic control (one member—one vote), cash trading, political and religious neutrality, constant expansion and promotion of education and information.

Perhaps the best summary of this farm chemical organization can be found in President Browder's report to members last year:

"Our program is unique. It is fundamentally sound and it is something that we, as farmers, are doing for ourselves. Its success in the future lies in our realizing the necessity of time and energy spent and our willingness to get our shoulders to the wheel along with the man across the fence, in the next county and throughout the state." ◆

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5-3 Scale Seal

At least three fertilizer manufacturers have used the Cunningham scale seal successfully, according to letters received by Applied Engineering Co. "Complete satisfaction in service" is the way one formulator described the use of the seal on scales in his plant. The device fits over standard model scales, protecting them from foreign matter and corrosion under severe conditions. It operates with a patented liquid seal according to literature available from the company. **Code Number 5-3.**

5-4 Pneumatic Conveyors

Scores of materials, including many in the fertilizer and pesticide industries, can be conveyed pneumatically and efficiently with Convair systems. Phosphate rock, guano and lime are just a few of the materials that lend themselves to such a system, the company states in an illustrated bulletin. Systems are highly flexible and can be adapted to any specifications in your plant. **Code Number 5-4.**

5-5 Udet F

Use of Udet F in ammoniated mixed fertilizers is described in detail in a new bulletin from Universal Detergents, Inc. The material comes in a 50 per cent and a 90–95 per cent active form. It is synthesized specifically for use in the fertilizer industry, giving instantaneous solution in low moisture materials, permitting use with no change in customary operating procedures and time schedules. **Code Number 5-5.**

5-6 Antara Chemicals

Farm chemicals is one of the industries which should be interested in a new catalog issued by Antara Chemicals Division of General Dyestuffs Corp. It covers wetting agents, sequestrants, emulsifiers and detergents and it tells how these materials can be applied in your process, **Code Number 5-6.**

Use card at right to get information on products and bulletins. For additional requests write FARM CHEMICALS on company stationery, giving appropriate Code Numbers.

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5-5	Udet F
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5-7 Desk Calculator

Is dust control your job in your plant? If it is you will be aided by a handy desk calculator available from Pangborn Corp. The six-page, pocket size folder presents formulas and other data, including constants and conversion tables, useful in dust control and other engineering problems. **Code Number 5-7.**

5-8 Thayer Scale

Something new in automatic scales is described in recent literature from Thayer Scale and Engineering Corp. It's the new Thayer Model 200S checkweight scale which automatically indicates the weight of filled containers such as bags, drums and cartons and then separates the off-weight containers from properly filled packages with a two-way conveyor. Independently adjustable tolerance settings establish over-weight and under-weight limits, according to a bulletin. **Code Number 5-8.**

5-9 Uses for Aldrin

Pesticide formulators will be interested to note the diversified uses of Shell Chemical's aldrin and dieldrin for controlling many pests. Two new booklets from the Julius Hyman & Co. division of Shell describe application of aldrin for control of Southern corn rootworm on peanuts and its general use against corn rootworm. You can mix Shell's aldrin with fertilizer or apply it to the soil as a dust or spray for control of soil insects. **Code Number 5-9.**

5-10 Gross Bagger

Textile or multiwall bags can be weighed and filled with fertilizer and other materials with a new hand-operated gross weighing scale, according to a bulletin from Richardson Scale Co. It is designed for highly accurate gross weighing and has an automatic cut-off system that shuts off the flow of material when the bag is almost loaded. After the cut-off the operator dribbles material into the bag until the exact weight is attained. **Code Number 5-10.**

5-11 Dithane

How Dithane keeps potatoes free of blight is told in a new folder issued by Rohm & Haas Co. Latest data on advantages of the chemical to control early and late blight on the crop is given in the color folder. Dithane is the company's trade name for zineb. It is compatible with all commonly used potato insecticides. **Code Number 5-11.**

5-12 TeeJet Spray Nozzles

TeeJet spray nozzles are supplied in three basic spray angle series—65, 73 and 80 degrees—a booklet from Spraying Systems Co., states. The nozzles are ideal for spraying herbicides and insecticides according to the company. **Code Number 5-12.**

5-13 Ammonia Applicator

A price list and complete data on the Sesco ammonia applicator, together with illustrations, is available from Sesco Incorporated. Their "three in one" product is made for rocky, stumpy soil, pastures and deep application, according to the literature. Complete specifications for the equipment are given. It weighs 2100 pounds and has a row clearance of 31½ inches. **Code Number 5-13.**

5-14 Trona Potash

Long years of experience in the industry are one of the chief recommendations of American Potash & Chemical Corp., makers of Trona potash. Basic chemicals for the pesticide industry are supplied by the company, including fumigants, insecticides, herbicides and defoliants. Company literature describes the complete line. **Code Number 5-14.**

5-15 V-C Bags

Which V-C multiwall bag is the best for you? asks Virginia-Carolina Chemical Corp. Whatever the answer, according to recent company literature, packaging will be easier and more economical when you use its products. **Code Number 5-15.**

5-16 Bulk Materials Handbook

Interested in cutting your materials handling costs? Of course you are if it can be done, and Hough declares it can if you use the company's Payloaders. They are constructed for flexibility and they can be operated at low cost in handling fertilizer and other bulk materials. Free booklet tells how to analyze, organize and set up an efficient handling system. **Code Number 5-16.**

5-17 Hudson Folders

Three excellent folders telling the many advantages of using Hudson multiwall sacks are available from the company. Called "Avoid Breakage," "Dependable Source of Supply" and "Sack Sense," they have excellent tips on packaging. Also available is information on Hudson's special replacement guarantee. **Code Number 5-17.**

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The toughest three-letter word in business

"But . . ."

The word a man uses when he starts by nodding yes and ends by saying no.

"But . . ."

The word on a Multiwall buyer's tongue just after he's said, "Well, as long as we order by specification, I guess one brand's as good as another . . ."

Executives who purchase more than 85 per cent of all Multiwalls have a big BUT there.

They testify* that there are many other considerations. Among the most important, the reputation of the manufacturer. They judge him by his record of reliability, his effort to meet delivery dates, his willingness to give a full measure of service.

We welcome the challenge of the toughest three-letter word in business. We believe the attention big buyers of Multiwalls pay to the *extra* factors—dependability, for instance—has a lot to do with their giving Union a greater proportion of their Multiwall business.

More so every day . . .

IT'S UNION FOR MULTIWALLS

TRADE MARK UNION

*August, 1951 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING

Concluding portion
of FPC report on

PESTICIDES: Development, Marketing

PART II of this article continues with section III on toxicological data requirements. For first part see April FARM CHEMICALS, page 34.

FARM CHEMICALS presents herewith the second portion of a report by the subcommittee on pesticides of the Food Protection Committee, National Research Council. The report was released by Dr. George C. Decker, chairman of the subcommittee, and was distributed by the National Agricultural Chemicals Association. Last month sections dealing with data on chemical and physical characteristics of pesticides, biological or use data and the first part of the section on toxicological data were presented.

WITH these factors in mind, the following tests should be included in a tentative program which reasonably could be expected to yield the toxicological data needed to assess hazard.

1. **Acute Toxicity.** As a minimal program the LD_{50} should be determined in at least two species and in one of them by at least two routes of administration, the oral and an appropriate parenteral route.

   Sufficient animals must be used to permit statistical evaluation of the reliability of the LD_{50} values determined. The rat and some other rodents are usually satisfactory for this purpose.

   In addition, the acute oral LD_{50} in rats should be determined for the finished commercial formulation to ascertain the influence of other ingredients on the acute toxicity of the active ingredient under study.

   Sufficient acute toxicity data should be obtained in dogs to permit a reasonably accurate estimate of the lethal dose in that species.

   For the benefit and protection of those who must apply the material in crop testing and thereafter, information should be developed with respect to the irritating and sensitizing properties of the compound. Also, data concerning toxicity by percutaneous absorption and by inhalation should be obtained if there is presumptive evidence of hazard via these routes.

   The signs, symptoms and the clinical course of poisoning and if possible the mode of death should be described.

2. **Subacute Toxicity.** (Now generally regarded as any toxicity test of a duration shorter than one year.)

a. **Oral.** A 90-day feeding test in rats may be regarded as economical in that it yields many needed data for a relatively modest expenditure in time and funds.

   Ten animals of each sex at each of several feeding levels should yield information which may determine at this point whether the proposed use is too hazardous to warrant further toxicologic study. The information obtained may also serve as a guide in selecting feeding levels for chronic study.

   The data sought may include, at each of the several feeding levels, the effects in relation to growth, mortality, blood changes, organs—as measured by both weight and histopathologic findings and such alterations in functions and behavior as may be apparent from gross observation. Also the chemical analysis of tissues may yield valuable preliminary information with respect to storage.

b. **Percutaneous.** As a general rule three or more rabbits are treated at each of several dosage levels for at least three weeks. The material is applied daily to the clipped skin, care being exercised to avoid ingestion by licking. The indices of injury enumerated in the preceding paragraph also apply here.

3. **Chronic Oral Toxicity.** (Now generally regarded as lifetime or two-year feeding in the rat and one year or longer in the dog or monkey.) Such long term tests are conducted on the premise that the possible effects of the lifetime ingestion of a pesticide in food by man cannot be predicted with tests less stringent than lifetime feeding in the short lived animal such as the

rat, and one year or longer feeding in the dog or monkey. Obviously, these tests may be either inadequate to the purpose or more stringent than necessary, but the presently available backlog of data has not furnished a more rational alternative.

a. Rats. Usually the material under test is fed in the diet to weanling rats at several levels, including a control diet containing none, with ten or more rats of each sex at each level. The levels to be fed should be chosen on the basis of the data obtained in the subacute feeding tests, an effort being made to select levels which will include one which will produce no effect, one definite damage and one or more intermediate in effect.

When time is a pressing factor, the subacute rat feeding test may be set up so that a sufficient number of rats at each dietary level can be continued for the two year period if the 90 day data indicate the desirability of doing so.

Data collected in the two year tests may include those in respect to growth, reproduction, mortality, organ weights, histopathologic and hematologic findings, blood and urine chemistry, tissue storage, excretion, the occurrence of blood dyscrasias or cancer, such changes in behavior and function as may be determined by gross observation and such other data as may be dictated by judgment in special circumstances.

b. Dogs or Monkeys. Three or more adult animals are usually fed the material under test at three or more dietary levels for one year or longer. Similar data are sought as in the chronic feeding tests with rats. The dog or monkey tests generally are started after the rat tests have been in progress long enough to provide data to aid in selecting the feeding levels likely to be the most informative.

c. Where **human exposure** has occurred, all appropriate tests should be employed to determine whether there have been any physiological or other effects.

Careful testing of all pesticides in the laboratory before marketing is important. Here they are tested at Chapman Chemical Co.

4. Pharmacodynamic and Biochemical Investigations.

a. Pharmacodynamic. The pharmacodynamic tests will vary in scope, the aim being to describe the effects brought about in functional systems and the mode of action of the compound.

There exists no succinct way of describing the possible extent of investigation necessary, this being variable with the systems affected and the technics available for the study of such functional effects. The program should at least provide a basis for the therapeutic treatment of accidental poisoning if technically possible.

b. Biochemical. These investigations should be designed to discover the extent of absorption, detoxication, accumulation, storage and excretion. Here again the investigation's scope will vary from compound to compound and with the intricacy of the processes which should be elucidated. The minimal program should seek to describe the routes of absorption and excretion, the extent and site of storage, if any, the rate of release from depots and the functional implications thereof.

5. Special Considerations. In the interpretation of the toxicologic data, emphasis should be given qualitative factors, including among others:

a. The uniformity of response within and among species.

b. The occurrence of unusually alarming reactions, as carcinogenesis, or blood dyscrasias and

c. The occurrence of sensitivity, tolerance or idiosyncrasy in response to exposure to the compound.

C. Determination of Hazard. Once the toxicologic data have been assessed and the toxicity of the compound adequately described, there remains the task of estimating hazard by balancing toxicity against possible intake. In this a number of considerations become pertinent, including:

1. The nature and degree of adverse effect which the pesticide may produce and the class of persons which may be affected by it.

2. The proportion of the usual diet which is composed of foods in which the pesticide may appear.

3. The amount of the residue that will remain in foods when the pesticide is used in accordance with accepted practices.

4. The likelihood of gross misuse of the pesticide that might lead to excessive residues.

5. Whether the pesticide is to reach the consumer by direct additions to food or indirectly through animals which have consumed the pesticide.

6. The possibilities of alteration of the pesticide after its addition to foodstuffs or consumption by animals.

7. The extent of the presence of chemically or pharmacologically

Tests with field crops, like this one which shows effectiveness of Pittsburgh Ag. Chem's Systox, are important in preparing pesticide products.

similar substances already in the usual diet.

8. The ease with which persons may avoid foods containing the pesticide.

IV. Coordination of the Development of the Chemical, Biological and Toxicological Data.

The foregoing sections make apparent the magnitude and complicated nature of the broad research program required for the development of a new pesticide, involving the efforts of several different groups of investigators.

USDA tests many insecticides. Here worker sprays citrus trees.

In such a venture, integration of effort is a necessity if excessive costs in time and funds as well as undesirable delays in the development and marketing of needed pesticidal compounds are to be avoided.

For example, analytical methods should be developed early in order that residue levels on edible crops shall be defined and the data made available to assist others in planning intake levels for chronic toxicity studies. Analytical methods should be further refined for use in biological fluids before pharmacological and biochemical studies are undertaken.

Information on acute and subacute toxicity adequate to define operational hazards should be in hand before agricultural workers are exposed extensively in field tests.

Complete knowledge of many factors pertaining to pesticide usage, performance and ultimate safety can be developed only through actual use in large scale performance tests. Hence, any system proposed for regulating the distribution of new materials should provide for their progressive release with recognized steps between strictly controlled small-plot experiments and full scale commercial operations.

Only a portion of the desired data can be obtained through observations on usage on non-food crops. Therefore, progress would be greatly enhanced by large scale experimental or otherwise provisional use of a promising material on a nominal percentage of a given crop as soon as residue and subacute or preliminary chronic toxicity data establish its safety beyond a reasonable doubt.

Because chronic toxicity largely pertains to a continuous intake of marginal quantities of a chemical over long periods of time, the possible temporary occurrence of such a residue on a nominal percentage of a crop would create no undue hazard. If, however, residues greatly in excess of the anticipated or safe level are encountered in large scale or semi-commercial treatments, the produce therefrom should be withheld from the market and not used for human or animal food.

The proposed procedure would permit the earlier safe development of a pesticide, because voluminous data not otherwise obtainable could then be accumulated during the period in which lengthy, detailed toxicological studies were being conducted to develop more precise chronic toxicity data on which ultimate safe residue levels for the crop as a whole could be based.

The chart represents an attempt to portray graphically a workable plan of integration of effort among the chemical, agricultural and toxicological teams working on a given compound.

Special circumstances often dictate changes in such a general scheme and it may be modified to meet problems unique to individual investigation. ◆

They're not ready for full-scale use but Monsanto has developed

A SOIL CONDITIONER FOR AGRICULTURE

SOIL CONDITIONERS are getting closer to practical application in agriculture—both in formulation and in price.

That fact was brought out last month with announcement by Monsanto Chemical Company that it had developed a new formulation of its Krilium for use in preventing soil crusting at a cost as low as $5 an acre.

The new product, called Krilium Soil Conditioner Liquid, was developed specifically for crust control in surface application by growers of row crops, according to Roy L. Brandenburger, general manager of the company's merchandising division.

Easy to Apply

Because the liquid conditioner can be applied directly to the surface of the soil with conventional spray equipment, farmers now can plant and cover seed and spray on the conditioner in a single operation.

When necessary, the company points out, fertilizer also may be applied in this operation.

No Duplication

Brandenburger stressed the fact that the new type conditioner "in no way replaces or duplicates the currently available powder formulations of Krilium."

The material is being marketed at a retail cost of $7.50 a gallon in single-gallon units and at $5.92 a gallon in five-gallon containers. Drums containing 55 gallons of the liquid conditioner cost $5 a gallon.

The liquid conditioner has been tested in surface applications to various row crops by North Carolina State College, Ohio State University and by company scientists in laboratory and field.

Tested on Cotton

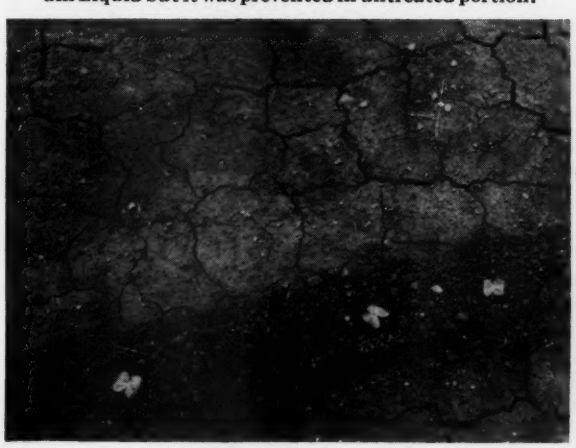
Tests with cotton involving 40-inch row spacing showed that Krilium requirements varied from one-half gallon per acre in the case of ¼ in. bands to one gallon for two-inch bands.

In announcing availability of the new formulation Brandenburger stated "since Monsanto's earliest work in the development of synthetic chemical soil conditioners, our company has realized the many potential applications of these products in commercial-scale agriculture."

He termed Krilium Liquid as the first "effective and economical weapon" farmers have against the widespread problem of soil crusting.

The company claims that in developing the new formulation it has produced the "most active and effective liquid soil conditioner currently available." ◆

Cotton emerges in strip of soil treated with Krilium Liquid but it was prevented in untreated portion.



Crusted condition in untreated soil prevents germination of cotton. Inset shows results with Krilium.

Pesticide formulators note:

Use These Charts To Plan Your Sales

In marketing pesticide materials, it's important to know just where the insects will be that your materials are designed to kill. Maps with this article, prepared by the Bureau of Entomology and Plant Quarantine, USDA give the outlook for four bugs. The maps appeared in the Cooperative Insect Report *issued by the Bureau.*

SPRING surveys of insect conditions throughout the United States show that limited but serious infestations of grasshoppers can be expected in the Mid and South west. In addition large numbers of Mormon crickets are anticipated in numerous western areas.

Local but serious cropland grasshopper infestations have been forecast for scattered Midwest and Southwest areas. These are expected to occur in central South Dakota, northeastern Wisconsin, the Texas panhandle area and central Utah.

Southern Illinois, Indiana and Ohio may be affected if dry weather prevails in that area. Invasions of cropland in Idaho, Washington and California by grasshoppers breeding in surrounding areas combined with a buildup of Melanoplus mexicanus in the first two states might produce some problems in those areas.

Some Reduction

Some reduction in infestation of the principal hopper in California, Melanoplus devastor, is expected from recent egg surveys.

Largest area expected to be seriously affected by range land grasshoppers is that in northeastern New Mexico and extending into Oklahoma, Colorado and Texas.

Severe infestations also are expected to occur in Montana, Idaho, Washington, Oregon, Nevada and Utah, although the affected area is not so great as the one in New Mexico.

A rather unusual range infestation in North Dakota is different in that the species involved overwinter as nymphs. California and Arizona have only small local range infestations although the one south of the Seligman area treated in 1952 is a threat and ranchers may request public assistance from Arizona and the Federal government in 1953.

Mormon Crickets

Substantial buildups of Mormon crickets occurred in most historic cricket areas and optimum conditions for their development prevailed throughout the intermountain area in 1952. Heavy infestations are anticipated in the northern half of Nevada and the Tooele Co., area of Utah despite extensive and successful 1952 control efforts.

Smaller but heavy infestations are expected in Idaho, Oregon, California, Montana, Colorado and Wyoming. These are termed vigorous and indicate the tendency to continue a build-up similar to that which occurred during the 1930s.

Chinch Bug

Larger numbers of chinch bugs than usual were reported entering hibernation during the fall of 1952 in a number of states including Oklahoma, Arkansas, Missouri and Illinois but fewer were recorded in Kansas, Nebraska and Iowa than last year.

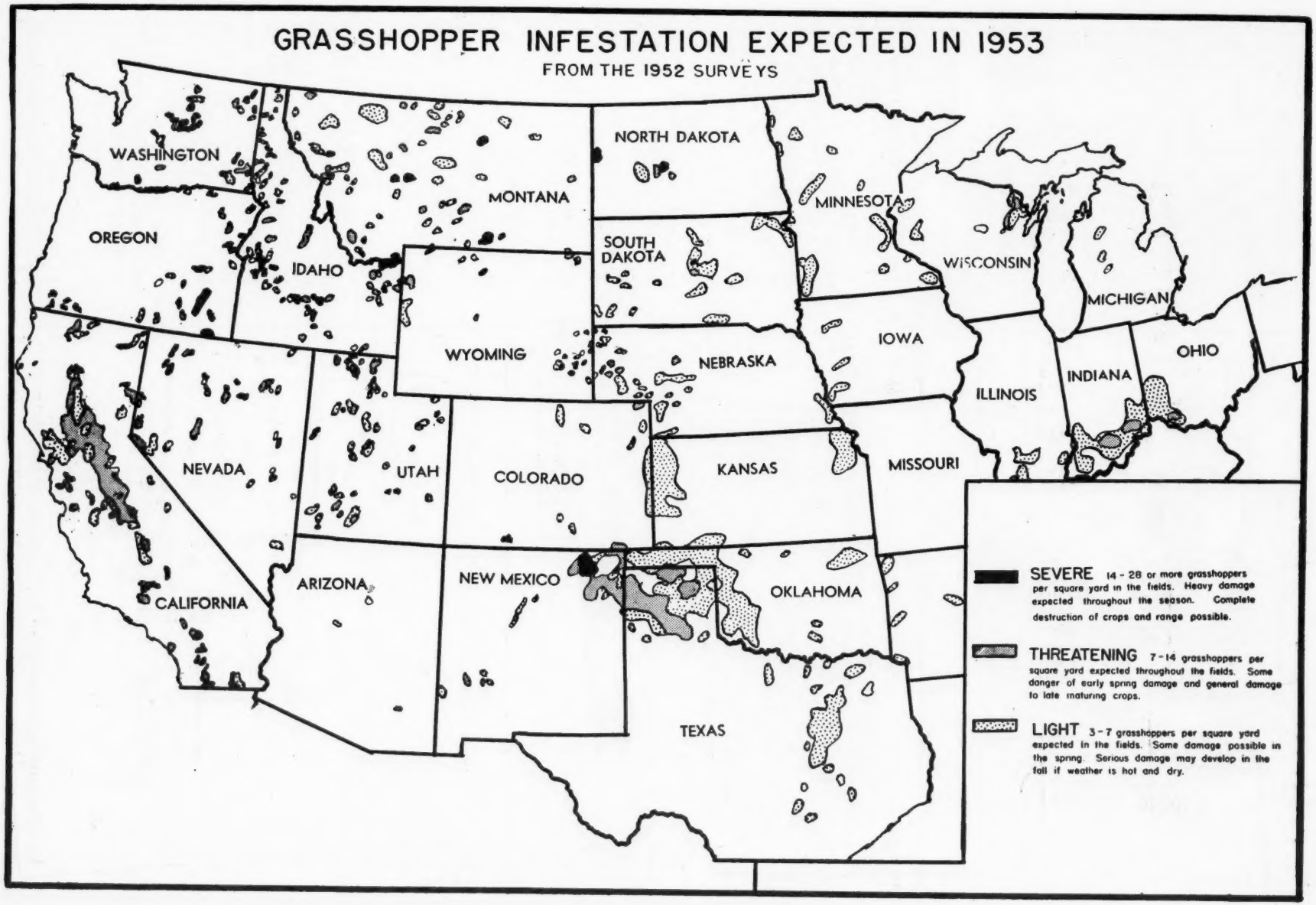
Indiana remained about the same as in 1951 and local infestations in that state may do some damage. If spring and early summer weather should be warm and dry in the three states reporting reduced infestations, the chinch bug could cause some trouble and require control measures.

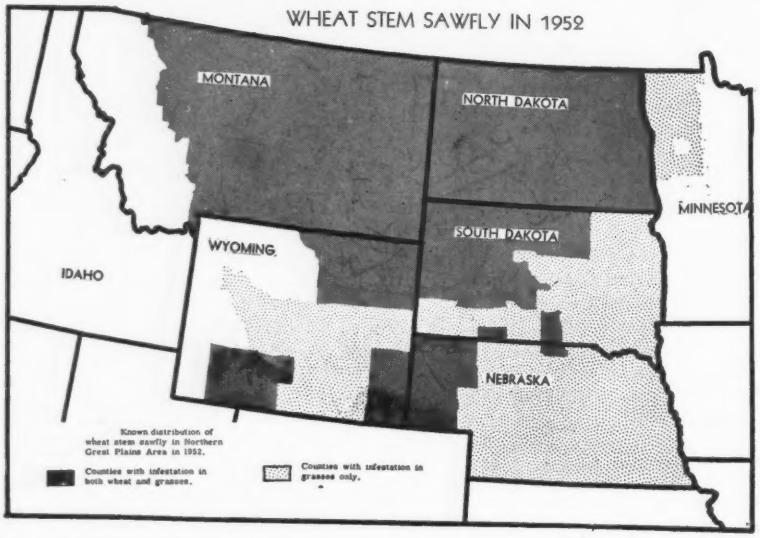
Wheat Stem Sawfly

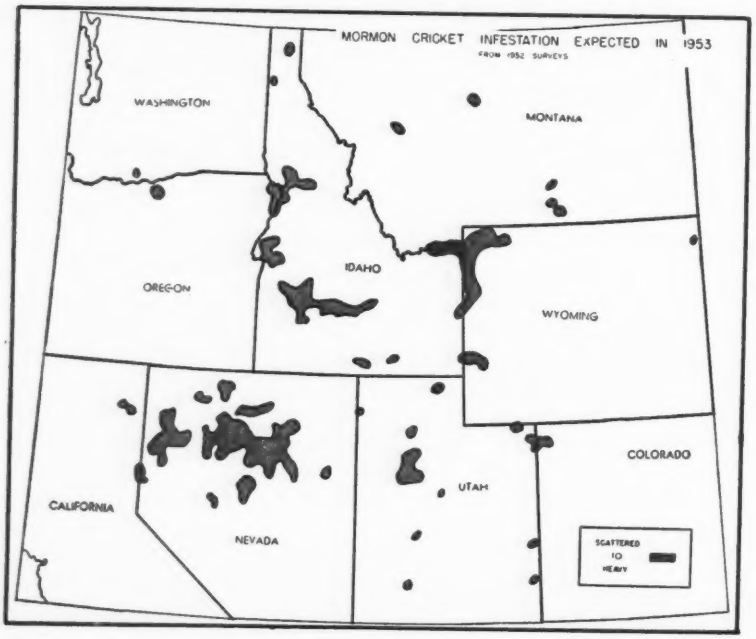
Surveys carried out during 1952 show 122 counties newly infested with the wheat stem sawfly; 76 in Nebraska, 40 in South Dakota and six in Wyoming.

The insect now is known to occur on wheat and grasses or grasses only in an area including all of South Dakota and North Dakota, all of Montana east of the Rockies all but nine Wyoming counties, all but one in Nebraska and 12 counties in the Red River Valley of Minnesota. Infestations have been found in wheat as well as grasses in 40 counties outside of Montana and North Dakota where wheat is considered the important host plant.

Total loss of wheat in Montana and North Dakota caused by the sawfly during 1952 has been estimated at nearly eight million bushels of which about seven million was accounted for by stems cut by the sawfly. In Montana, 34 per cent of the surveyed fields


GRASSHOPPER INFESTATION EXPECTED IN 1953
FROM THE 1952 SURVEYS
WASHINGTON
OREGON
CALIFORNIA
IDAHO
NEVADA
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
WISCONSIN
ILLINOIS
MICHIGAN
INDIANA
OHIO
SEVERE 14 - 28 or more grasshoppers per square yard in the fields. Heavy damage expected throughout the season. Complete destruction of crops and range possible.
THREATENING 7 - 14 grasshoppers per square yard expected throughout the fields. Some danger of early spring damage and general damage to late maturing crops.
LIGHT 3 - 7 grasshoppers per square yard expected in the fields. Some damage possible in the spring. Serious damage may develop in the fall if weather is hot and dry.





were found infested compared to 32 per cent in North Dakota. This amounts to nearly two million bushels affected in Montana and more than three million in North Dakota.

Other Reports

Other insect reports of special interest include results of spring boll weevil survival counts taken in Florence Co., South Carolina, where, with the exception of 1950, survival was the highest per acre on record.

Ranging from 0 to 32,428 per acre of surface trash the average infestation was 5,932 weevils, 94 per cent of the number found in hibernation last fall.

Army Cutworm

Serious damage to wheat in eastern Colorado by the army cutworm and an infestation of the pest covering a wide area in Kansas have been reported. In Colorado, three to four larvae per linear foot have been found and both surveys and aerial insecticide applications have begun.

The Kansas infestation covers much of the central portion of the state although scattered reports have been received from western counties. So far, populations indicate that, although the cutworm is more abundant than usual, the situation cannot be termed an outbreak.

Other notes from the BEPQ Cooperative Economic Insect Report include the following.

Control of lygus bugs on alfalfa grown for seed in Minnesota increased seed yields up to 300 per cent.

* * *

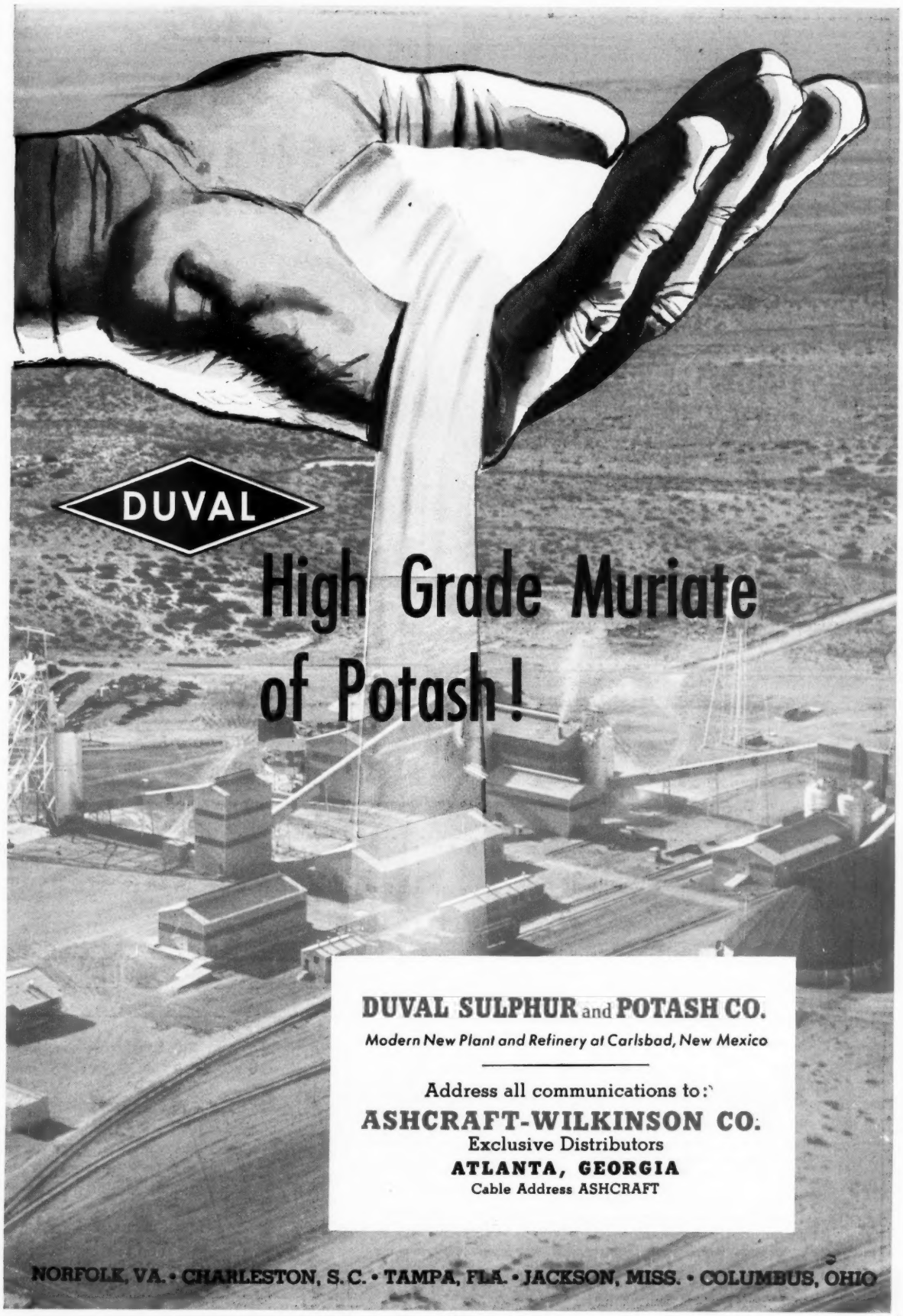
Loss of grain corn last year due to damage caused by the European corn borer is estimated at 53,270,000 bushels, 1.7 per cent of the estimated national crop. This represents a crop loss value of approximately $77.2 million dollars.

* * *

The Clover Seed Chalcid caused an estimated $339,000 loss to Utah *alfalfa* seed growers in 1952.

* * *

It is estimated that 100 to 200 different insect pests in North Carolina were on the receiving end of control methods during 1952. ◆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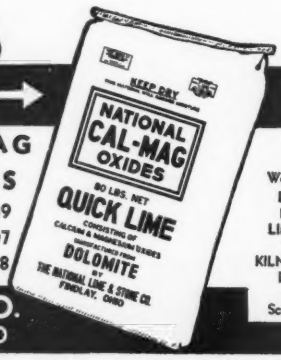

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Salesmen in all areas can use these points to

Sell Fertilizer To Double Yields

By Emil Truog
Chairman, Soils Dept.
University of Wisconsin

TO intimate that Wisconsin's crop yields could be doubled through the proper use of adequate amounts of lime and fertilizer may appear to be a rash and reckless statement. Yet, that is exactly what recent field experiments and demonstrations tell us.

Even if it could be done, some may question the desirability of doing so because of the danger that crop surpluses, such as plagued us in the thirties, might again occur.

I will give you some reasons why this danger probably is not imminent, or if it does exist, why it should not deter us in Wisconsin from going as rapidly as possible in the direction of doubling our crop yields.

Five Important Points

1. The population of this country now is growing at a tremendous pace. Every morning we have to set our tables for 7,000 more hungry mouths. Total increase each year is more than two-thirds the population of Wisconsin and represents a tremendous increasing demand for food.

2. There is now and has been for many years a shortage of home-grown feed in Wisconsin. Every year Wisconsin farmers spend more than 100 million dollars for feed brought in from other states. Thus, Wisconsin has within her own borders right now a market which in terms of dollars is annually equal to about one-fifth the value of all of her crops.

Emil Truog

Because the freight cost alone in shipping feed into the state can easily be five times as much as it is for shipping in fertilizer of equal feed producing potential, the great economy from the freight angle alone of obtaining the feed through the fertilizer route is self evident.

3. A desire or consciousness of responsibility (born partly in thinking of our own safety and welfare) to help feed famine stricken areas or countries in various parts of the world is developing rapidly in this country. This will help greatly in the future to remove such food surpluses as may occur.

Slow To Change

4. Past experience tells us that farmers as a group make changes gradually. Thus for the farmers of Wisconsin to increase their use of lime and fertilizer sufficiently to double present crop yields probably will take 25 years or more. By that time our population probably will have risen by at least 50 million persons.

5. Wisconsin farmers of course are in competition with farmers of other states and countries. The best way to meet this competition is to lower cost of crop production which, under present conditions, can most effectively be done by doubling crop yields. This will greatly lower feed costs and may become the most important factor in the survival of our dairy industry which is meeting increasing competition every day, both by substitutes and greater dairy production in other regions.

It should be noted that if Wisconsin farmers do not move rapidly in the direction of doubling crop yields they will face the grave danger of ruinous competition by farmers in other states who may advance more rapidly in reducing cost of production through the avenue of high yields.

Moreover, it will be very profitable for our farmers to double their yields through the use of lime and fertilizer because each dollar invested in these materials usually returns three to five dollars in terms of increased yields. Also, because the main cost in producing crops is the labor involved in plowing, planting and cultivating and this labor is practically the same with high or low yields, the great advantage of high yields is readily apparent.

Will Help to Protect Dairy Industry

A concerted move in the direc-

tion of doubling Wisconsin's yields of feed and forage crops is one of the main avenues leading to definite and material protection of the state's dairy industry against the ruinous competition of low cost dairy product substitutes, such as oleomargarine. This follows from the fact that feed costs represent at least 50 per cent of the total cost of producing milk, and the clear way open to lower feed costs and in turn dairy products so as to improve their competitive market position is a doubling of yields of feed crops.

Thus, our experiments have shown that whenour present average crop yields are doubled, the actual unit cost of the additional yield (unharvested crop) beyond the average yield may be as low as 15 cents per bushel for corn and $2.50 per ton for alfalfa hay. These low costs arise from the fact that they are free of such charges as those involved in plowing and other tillage and payment for seed and land taxes, which are the same regardless of yield.

When yields are doubled through the use of lime and fertilizer, and the top one-half of the production on a unit basis is produced for one-tenth of the unit cost with the lower yield, the unit cost of the whole production becomes only 60 per cent of what it is with the lower yield.

An important point that should not be overlooked in this connection is the influence which doubling our crop yields would have not only on soil conservation but conservation in general. Every day nature tells us in the field and in the forest that the best way to prevent soil erosion is to keep the land covered with a vigorous growth of vegetation.

A high state of soil fertility not only promotes the growth of such a cover, but also promotes the development of those soil conditions which favor a maximum absorption of water by the soil and thus a minimum runoff and its consequent erosion.

Other Benefits

The more vigorous the vegetation the greater the removal of water from the soil by transpiration of the vegetation, so that the capacity of the soil to absorb more water is rapidly renewed. And finally, the higher the yields of crops on the level and less erodible land, the less the need of growing crops that require tillage which induces erosion on the sloping land. It can then be devoted to sod crops, forestry and wildlife refuge. Doubling crop yields promotes conservation in general.

If we accept the proposition that the yields of Wisconsin's crops can be doubled through the use of lime and fertilizer, and that this goal should be striven for as rapidly as possible, many questions naturally arise relating to the best procedure for achieving this goal.

If Wisconsin farmers could double their crop yields by using more lime and fertilizer, why couldn't farmers in other states? The answer of course is they could. Fertilizer manufacturers, who are taking an important part in the USDA—Land Grant College Program to stimulate use of adequate fertilizer and lime should find this discussion by Emil Truog of the situation in Wisconsin a model one for telling the story of what plant foods and conditioners can do for crops. It was presented before a meeting of fertilizer and lime dealers at the University of Wisconsin, Feb. 2.

Naturally, the lime and fertilizer manufacturers and dealers will have to play a most important role in a program geared to this end. That means lime and fertilizer dealers should have at hand the latest and most authentic information relating to the most effective methods of using lime and fertilizers under various conditions.

First, it cannot be too strongly emphasized that for general farming, soils should be limed to near the neutral point, that is, *p*H 7. This is basic to a program designed to double our yields of hay, corn and small grains. It has now been definitely established that liming of acid soils makes the native phosphorus of soils much more available and also helps greatly to keep available what is applied as soluble fertilizer.

Liming to *p*H 7 brings this about much more effectively than does liming to *p*H 6 or even 6.5. If liming to *p*H 7 produced no other benefit than that of promoting the availability of phosphorus in soils, it would pay handsomely to do this liming. But liming produces many other benefits, such as an adequate supply of calcium and magnesium, more favorable conditions for nitrification and nitrogen fixation by legumes and improved physical conditions of a soil.

Not Enough Lime

In general, our applications of lime have been short in the past by about two tons per acre. Many soils that have been limed should be retested to determine the additional amount of lime needed to attain a *p*H of 7.

To double crop yields, the rate of fertilizer application in many cases will need to be greatly increased. In preparing land for alfalfa, high potash fertilizer applications of 1,000 pounds per acre and more should become common. Likewise, in preparing land for corn yields of 100-bushels per acre and more, much heavier fertilizer applications than have been common in the past are needed.

Here, heavy doses of nitrogen are particularly important because this crop is a heavy feeder on this element. A test which we have recently developed for available soil nitrogen is a great aid in determining the amount of nitrogen fertilizer needed. By using this test in conjunction with those for available phosphorus, potassium and lime needs, a complete prescription of the soil treatment needed for producing a 100-bushel yield of corn or other yield can now be given to farmers.

An example of how this prescription is arrived at follows:

A 100-bushel corn crop (ears and stalks) contains 150 pounds of nitrogen (N), 25 pounds of phosphorus (P) which is 60 pounds of fertilizer phosphate (P_2O_5), and 100 pounds of potassium (K) which is 120 pounds of fertilizer potash (K_2O).

These amounts must be obtained by the growing corn from the soil, manure and fertilizer applied, otherwise the 100-bushel corn yield is not possible. The less the crop can get of these elements from the soil, the

TABLE 1. Approximate Percentages of the Amounts of Nitrogen, Phosphorus and Potassium Present in Available Form in Soils and Applied as Manure and Fertilizers That May Be Obtained by the First Crop Grown

Sources of Three Nutrient Elements	Percentages Obtained by First Crop Grown		
	NITROGEN	PHOSPHORUS	POTASSIUM
Soil (of Available Present)	40	40	40
Manure (of Total Present)	30	30	50
Fertilizer (of Available Present)	60	30	50

more it will have to get from manure and fertilizer. The soil test results will tell us how much there is of these in the soil in available forms.

From these results we can calculate how much of each element will have to be added in the form of manure and/or fertilizer. The calculation must take into account the fact that a corn crop cannot in one season get or take all of each element that is available in the soil or is applied as manure or fertilizer. On the average it can get only about 40 per cent. Approximate percentages that a corn crop can get of each from the three sources are given in **Table 1.**

This method of writing fertilizer prescriptions for a 100-bushel corn yield was applied last spring to 173 fields on 162 farms. The farmers followed the prescriptions quite closely for the most part and the average acre yield for the 173 fields turned out to be 124 bushels, slightly more than double the state average of 60 bushels for 1952 which is the highest on record. Six fields yielded 150 bushels or more per acre, the highest being 160 bushels. These results provide strong evidence that yields of corn in Wisconsin could be doubled by use of adequate amounts of fertilizer.

Corn Potential

Corn yield records indicate that marked yield increases probably cannot be attained by means of higher producing hybrids, but rather that these increases depend on adequate liming and fertilizing. The average acre yield of corn in Wisconsin during the 1920–30 period (just prior to the introduction of hybrids) was 33 bushels; during the 1940–50 period (when more than 90 per cent was hybrid corn), it was 43 bushels, or an increase of only 10 bushels.

Thus, it appears that the introduction of hybrid corn cannot by itself bring about the high yields such as are made possible through adequate liming and fertilizing which make possible the growing of the needed corn population per acre.

In 1952, a very favorable season, Wisconsin's average corn yield, the highest on record, was 60 bushels per acre, and corn accounted for 40 per cent of the market value of all crops grown in the state. This market value for corn amounted to $210,000,000. A doubling of this yield through the use of adequate amounts of lime and fertilizer would have added a net increase in the value of this corn crop of considerably more than 100 million dollars after deducting the cost of the lime and fertilizer.

Summary

1. Field experiments and demonstrations in Wisconsin during the past 10 years indicate that crop yields in the state can be doubled by using adequate amounts of lime and fertilizer.

2. The necessary know-how for doubling our crop yields is at hand: The plant breeder has developed the needed high yielding and disease resistant strains of our main crops; pesticides for reasonable control of insects and diseases are available and soil tests for determining the lime and fertilizer needs for maximum yields have been developed.

3. Because of the rapid increase in population (2½ million annually) in this country, because Wisconsin farmers now purchase out-of-state grown feed costing over 100 million dollars annually, because there is an increasing tendency to share any excess food with needy people abroad and because it will probably take 25 years or more to induce three-fourths or more of our farmers to use the lime and fertilizer needed to double our yields, there exists no imminent danger of overproduction in this state.

4. It will be very profitable for farmers to double their crop yields through use of lime and fertilizer because every dollar invested in these materials normally produces increased yields worth three to five dollars, and even more; this increase is largely profit because the labor cost in growing an acre of crop is practically the same regardless of the yield.

5. Doubling yields in the manner indicated is the most practicable approach in many cases to soil conservation as well as conservation in general because it will reduce runoff and make the soil less erodible, and will lessen or eliminate need of growing crops that need tillage on sloping erodible land; the latter land then can be devoted to sod and forest crops and wildlife refuge.

6. If Wisconsin farmers move rapidly and intelligently in the direction of doubling crop yields through the use of lime and fertilizer, their net annual income can easily be increased by 100 million dollars and possibly double this amount or more in the next 10 years. Vigorous action in this direction offers by far the most feasible and certain avenue available for greatly reinforcing the "financial blood-stream" of the state.

7. To put into operation the know-how which will bring about a doubling of crop yields through the use of lime and fertilizers will require the teamwork of lime and fertilizer manufacturers and dealers, county agricultural agents, College of Agriculture extension and research workers and leading or pacemaking farmers. ◆

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FERTILIZER MATERIALS MARKET

New York

April 10, 1953

Sulfate of Ammonia

While the movement of this material was reported better than 30 days ago, it was not up to expectations in certain shipping areas and imported material still was available at certain Southern ports at prices in line with the domestic market. If export markets could be found for some of the domestic production, this would solve the problem.

Ammonium Nitrate

This material is one of the few fertilizer materials where the demand exceeds the supply and a shortage was reported in certain areas for nearby shipment. Producers were shipping as fast as production warranted.

Urea

Imports of this material continued heavy but were quickly absorbed by the trade with the current price around $130 per ton at the ports. Domestic producers are sold out for this season.

Nitrogen Solutions

Demand was heavy and material for quick delivery was slightly difficult to obtain as producers made every effort to fill existing orders.

Nitrogenous Tankage

Most producers had stocks available for prompt shipment. This situation was exactly the reverse in April of 1952 when a critical shortage of nitrogenous tankage occurred. Lower prices are expected for the new season.

Castor Pomace

While producers were shipping against previous contracts, very little new business was being booked. Supplies were adequate to take care of any anticipated increase in demand.

Organics

Organic fertilizer materials displayed a weak tone and prices were generally lower in all these materials. Tankage and blood were quoted at $5 per unit of ammonia, ($6.08 per unit N), f.o.b. shipping points but with firm bids slightly lower business was possible. Vegetable meals were easy in tone and soybean meal sold at $63 per ton in bulk, f.o.b. Decatur, Ill., and linseed meal at $65 per ton in bulk, f.o.b. Minneapolis. The Government offered cottonseed meal for prompt shipment from stocks they own but few buyers took advantage of the offering. The demand from the feed trade is very limited and more of this material is finding its way into fertilizer channels.

Fish Meal

This material was steady in price and imported material dominated the market on the East Coast because the menhaden fishing season has not started as yet.

Bone Meal

A better movement was reported but prices were not too firm and the demand from the feed trade has fallen off considerably recently.

Hoof Meal

Very little trading was reported with last sales on basis of $6.75 per unit of ammonia ($8.20 per unit N), f.o.b. Chicago. Production of this material has been lower the past few months.

Superphosphate

While mixed reports were heard concerning superphosphate, no shortage of any consequence has developed and buyers have had no difficulty in booking their requirements. Triple superphosphate, however, still remains tight and producers are booked to capacity.

Potash

Producers report shipments going forward on contracts at a heavy pace and March and April will probably turn out to be the heaviest shipping months for potash for the current season. No particular shortage was reported at any point.

Philadelphia

April 10, 1953

The raw materials market remains inactive. Tankage and blood are in large supply and prices are lower than in some time. Nitrate of ammonia continues scarce, while nitrogenous tankage is receiving little or no buying attention. Bone meal is easier. Superphosphate is showing better movement, and domestic potash withdrawals are quite active. It is estimated that the world production of agricultural nitrogen for the 1952–1953 growing season will be as much as 150,000 tons more than the consumption.

Sulfate of Ammonia.—Coke-oven is moving steadily and supplies of imported material are more than ample. Largely increased imports are looked for.

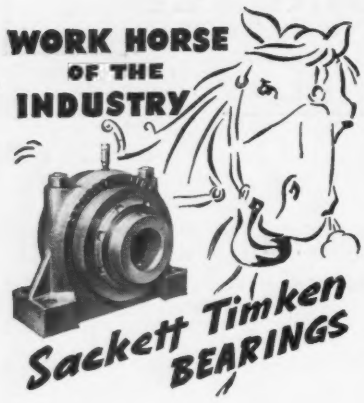
Nitrate of Ammonia.—This continues definitely tight, with demand much ahead of supply.

Nitrate of Soda.—Normal seasonal demand keeps this moving steadily, and stocks are plentiful.

Blood, Tankage, Bone.—Blood and tankage are in very weak position, with prices ranging from $4.75 to $5.50 per unit of ammonia ($5.77 to $6.68 per unit N), depending on location. Nitrogenous tankage is plentiful and demand poor. Steamed bone meal continues to be quoted at $70 per ton, but there is limited inquiry; in fact, some sales have been made several dollars per ton under this asking price.

Castor Pomace.—There is practically no buying interest and price remains at $37.25 per ton.

Fish Scrap.—Menhaden is nominal at $130 per ton for unground and $135.60 for ground. Market is awaiting opening of the new season, with some business being done on a "when-and-if" basis.



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FERTILIZER MATERIALS MARKET

Phosphate Rock.—Demand strong for contract shipments and supply somewhat tight—particularly the higher grade rock.

Superphosphate.—Shipments are moving more freely and there is no indication of surplus stocks at this time. Market is stronger.

Potash.—Contract shipments continue to be in heavy demand and movement is quite active.

Charleston

April 10, 1953

In some Southeastern areas the season is tapering off but demand for raw materials continues strong generally and supplies, except for nitrogen solutions and certain types of hard nitrogen, appear to be adequate.

Organics.—Interest, if any, in organics for fertilizer use is for future shipment for the new season. Current productions of domestic nitrogenous tankage continue in a well sold position at prices ranging from $4.60 to $5 per unit of ammonia ($5.59 to $6.08 per unit N), f.o.b. production points. Rather little imported nitrogenous is available at around $5.75 to $6 per unit of ammonia ($6.99 to $7.29 per unit N), in bags, c.i.f. usual Atlantic ports.

Castor Pomace.—Domestic production continues available in limited supply at $37.25 per ton, car lots, f.o.b. Northeastern production points, in burlap bags, less $2 per ton for shipment in paper bags.

Blood.—Domestic unground dried blood is indicated at Chicago at around $5 per unit of ammonia ($6.08 per unit N), and at New York, the same basis.

Potash. — Muriate of potash movements are steady from producing sources in this country and the price is unchanged. Imported material is available in limited supply at Atlantic ports at prices somewhat cheaper than the delivered cost of domestic production. Sulfate of potash is somewhat short of demand.

Ground Cotton Bur Ash.—This source of carbonate of potash, particularly adaptable for use in tobacco fertilizers, is available for prompt and future shipment at prices approximating the delivered cost of domestic sulfate of potash. Analysis currently is 38 per cent to 42 per cent K_2O.

Phosphate Rock.—The supply situation continues relatively tight with the high grade in shorter supply than low grade. Prices remain firm.

Superphosphate.—As the season nears its peak, shortages of normal superphosphate are developing but supplies generally are adequate. Demand for triple superphosphate exceeds supply.

Sulfate of Ammonia.—Demand continues strong, particularly in the Western States. Some supplies are available at Atlantic coast stock points.

Nitrate of Soda.—Shipments are being made in good volume from stocks at ports and from interior production points. No change in prices has been made this season.

Nitrogen Solutions.—In various sections, particularly the Southeast, demand exceeds supply.

Calcium Ammonium Nitrate.—Vessels continue to arrive carrying several brands of this 20.5 per cent nitrogen material and demand is active.

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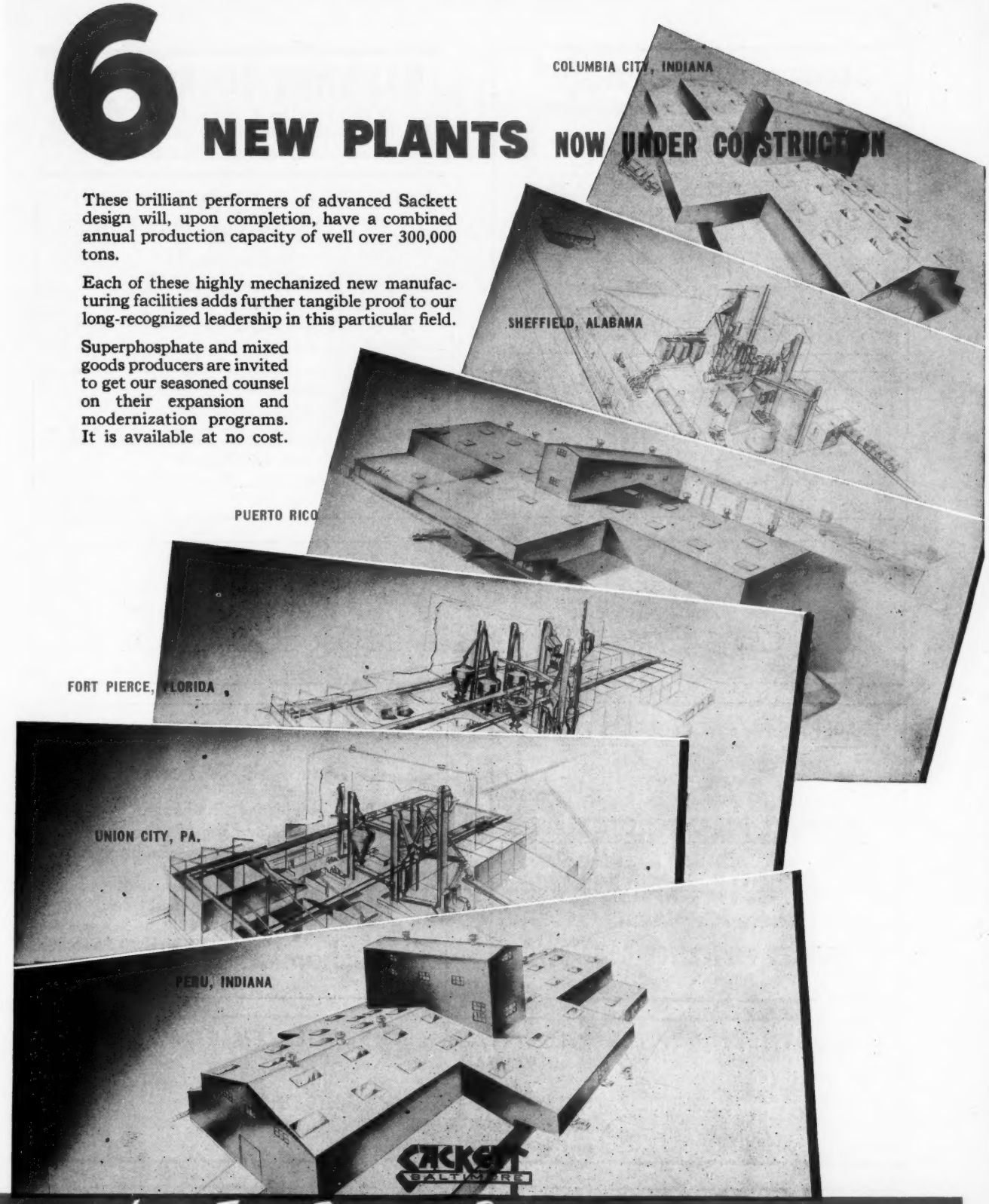

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Industrial News

New Products **New Plants** **New Appointments**

Potash Producers Charge 'Dumping'

Five major New Mexico potash producers charged in Congress late last month that Russian produced potash is being "dumped" on the United States market in considerable quantitites.

The charges were made by George E. Pettit, vice president of the Potash Company of America, who represented four other producers in the state. His testimony was given at a hearing by the House Agriculture Committee before the sub-committee on fertilizer and farm machinery.

The committee was told by Pettit and other persons testifying at the hearing that there are indications the Russian material is being dumped at cut-rate prices in an effort to get dollars for trade and to disrupt the American industry.

The group was asked to consider the matter further in an effort to determine the real extent of the reported dumping and what probable effect it could have on American agriculture and on the American Potash industry.

Pettit declared that if reports of Russian sales are proved, possible violations of the "anti-dumping" Act of 1921, as well as a number of other fair trade regulations contained in U. S. laws regarding imports, should be investigated.

Other testimony in support of the potash producers' stand was presented by several representatives of fertilizer manufacturers.

Among them were J. C. Crissey, G.L.F. Soil Building Service; Omar Sanders, Fertilizer Industries, Inc.; Charles Dunne, French Potash and Import Co., Inc.; C. B. Robertson, Robertson Chemical Corp.; A. J. Dickinson, Virginia-Carolina Chemical Corp.; W. E. Shelburne, Armour Fertilizer Works; Charles B. Lewis, Kembridge, Va. and J. R. Meyer, Eastern States Farmers Exchange.

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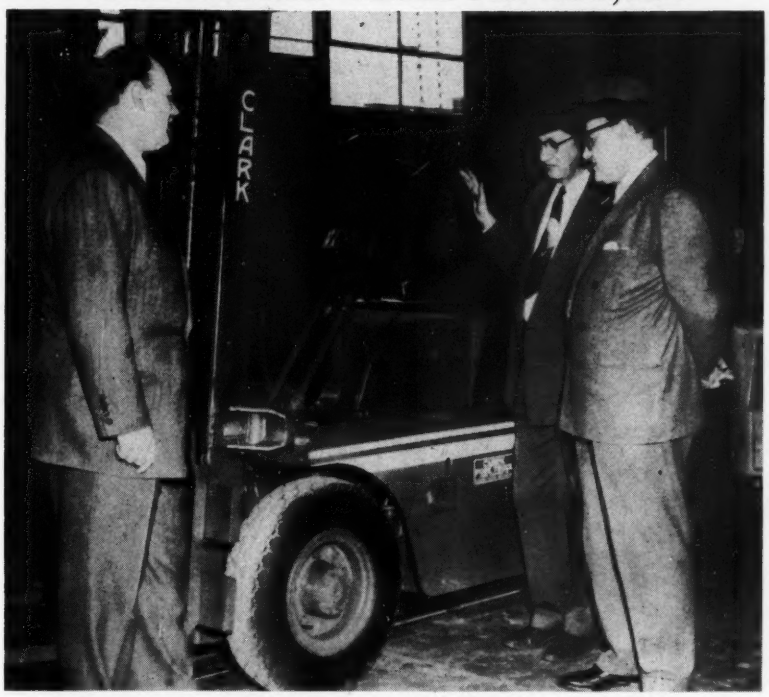

Production of its 150,000th unit—estimated to be one half the output of the industry, has been announced by Clark Equipment Co., largest manufacturer of industrial fork-lift trucks. Pictured above is No. 150,000, being inspected as it leaves the assembly line by (from left) R. H. Davies, vice president in charge of production at the Battle Creek plant; W. E. Shirmer, vice president in charge of industrial truck sales and George Spatta, president. Company started in 1919.

Brian Gets Sales Post At Florida Agricultural

Charles E. Brian has been named assistant sales manager for Florida Agricultural Supply Co., a division of the Wilson & Toomer Fertilizer Co., Jacksonville, Fla.

Brian

A Navy veteran of World War II, Brian received a B.S. degree from Eastern Illinois State Teachers College and an M.S. from the State University of Iowa.

He was district manager for a national manufacturer and distributor of pesticides.

Phillips Makes Addition

A new triple superphosphate plant for Phillips Chemical Co.'s Adams Terminal on the Houston ship channel, is under construction.

The plant will have a capacity of 405 tons of granulated triple super a day and will be integrated with existing facilities of Phillips ammonium sulfate operations at Adams Terminal.

St. Regis Gives Fellowship

Rexford A. Resler has been awarded the St. Regis Paper Co. Fellowship in Forestry. A senior at Oregon State College, Resler plans to continue in graduate work at the college next year.

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Industrial News

Smith-Douglass, San Jacinto Merge

A fertilizer manufacturer has merged with a producer of anhydrous ammonia in a move recently approved by directors of both companies.

Involved in the transaction are Smith-Douglass Co., Inc., manufacturers and distributors of mixed fertilizers and San Jacinto Chemical Corp., which makes anhydrous ammonia in a Houston, Tex., plant leased from the government.

Under terms of the merger, started several months ago, Smith-Douglass is the surviving corporation. It was announced jointly by R. B. Douglass, president of Smith-Douglass, and E. M. Fleishmann, head of San Jacinto.

After the merger has been completed the capacity at the San Jacinto plant will be upped from 70 tons a day to 110 without interruption of production. The anhydrous expansion is expected to cost approximately $1,600,000. It will involve no new financing on the part of Smith-Douglass.

Coronet Phosphate Co., a subsidiary of Smith-Douglass, produces phosphate rock and defluorinated phosphate in Florida.

Better Than Flypaper

Two Army chemical corps scientists have found that there's something more attractive to flies than fly paper—it's a chemical contained in the flies themselves.

The researchers, C. S. Barnhart and L. E. Chawick, found in experiments that flies leave some substance on food that is attractive to others of the insects.

They placed identical baits side by side in a cow barn with a fly population of at least 50,000. One bait had been exposed to flies for 20 minutes, the other for two minutes. The exposed bait soon was covered with flies while the other had relatively few on it.

Extracts of macerated houseflies next were prepared and tested, with the same results. Big question now being tackled by the men is to isolate the "fly factor."

FARM CHEMICALS wishes to clarify any erroneous impressions which may have resulted from publication last month of data on production of nitraphosphates.

The article referred to was entitled "The Cost of Producing 11-11-11 Nitraphosphate." It appeared on page 51 of the April issue.

Figures referring to costs of production on a before taxes basis at a Sheffield, Ala. site were formulated at a meeting of an NFA technical committee with a similar group representing the Tennessee Valley Authority.

Figures included in the paper, for similar installations in Chicago and Baltimore, were prepared by NFA after the joint meeting.

The report was prepared by the NFA committee and the opinions expressed were those of that committee.

Many Fertilizer Leaders At Cal. Fertilizer Confab

Members of the fertilizer industry, dealers and other agricultural leaders attended the first California Fertilizer Conference sponsored May 7 and 8 by the California Fertilizer Association.

It was held in the Hotel Marysville, Marysville, Cal., in conjunction with the Agricultural Extension Service of the University of California.

Among industry members speaking at the two-day session were Rod Taft, of American Potash & Chemical Corp., Los Angeles; F. Haven Leavitt, agricultural technologist for Shell Chemical Corp., San Francisco and George P. Bloxham, Pacific Guano Co., Los Angeles.

Dr. W. E. Martin, extension soils specialist, of Berkeley, was program chairman.

Diamond Announces Personnel Changes

Four personnel changes at Diamond Alkali Organic Chemicals division of Diamond Alkali Co., have been announced.

Involved in the moves are Dr. L. Gordon Utter, Albert F. Fuchs, H. E. Meadows and Charles L. Troph.

Dr. Utter, formerly plant pathologist for Phelps Dodge Refining Corp., now is in charge of all technical service work covering the company's expanding line of organic agricultural chemicals, with headquarters at Newark, N. J.

New assistant sales manager is Fuchs, who formerly was manager of the insecticide division of NACO Fertilizer Co. He also is located in Newark.

Meadows was appointed Southwestern technical sales representative with offices in Diamond's Houston, Tex. plant.

Troph has been transferred from the industrial chemical staff of the Chicago office to expand sales of Diamond's organic chemicals in the North Central region.

In another change L. J. Polite Jr., was made an assistant sales manager in the Northern territory.

FTC Hits Advertising

The Federal Trade Commission has cracked down on advertising claims made by Bostwick Laboratories for its insecticide products.

FTC ordered the company to stop advertising that "Bostwick Super-Aerosol Insect Killer" kills all crawling insects and that it kills insects faster than other insecticides now on the market.

The Commission also stopped claims of the company that the product is safe, non-toxic or harmless to humans, plants or animals.

Rinehart Appointed

Dr. James C. Rinehart has been appointed to the newly created post of development agronomist with United States Gypsum Co.

He formerly was associated with Rutgers University.

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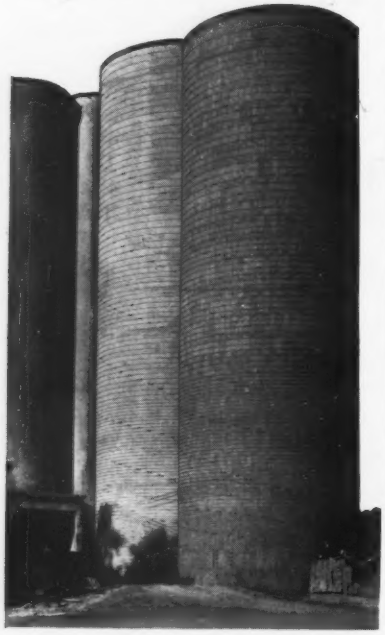
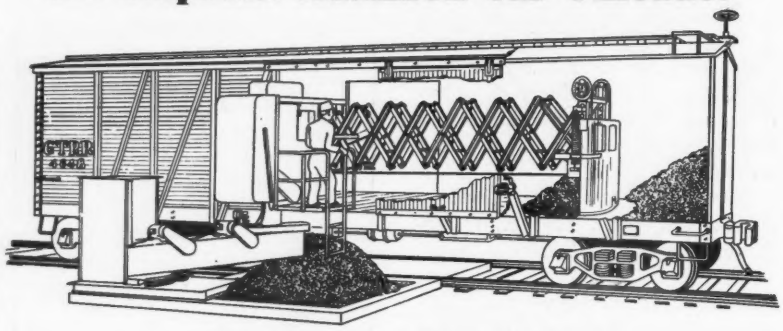


THE
MARIETTA CONCRETE
CORPORATION
MARIETTA, OHIO

Branch Offices:
509 Fifth Ave., New York 17, N. Y.
805 Bessemer Bldg., Pittsburgh 22, Pa.
Pulaski Hwy. at Race Rd., Baltimore 21, Md.
Mfgr. Rep.: John Mooer, 149 Peachtree Circle, N.E., Atlanta, Ga.

Industrial News

5-1 Stephens-Adamson Car Unloader



Cut-away view of Car Unloader in use.

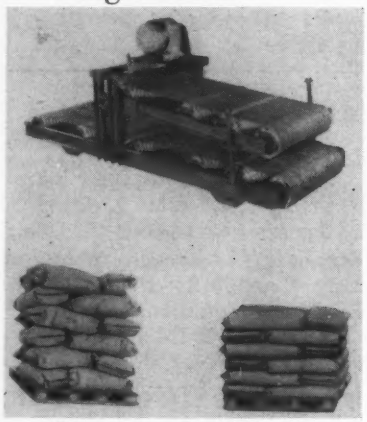
Dry chemicals and virtually any bulk material can be handled with a unique box car unloader designed by Stephens-Adamson Co.

Now available for operation between two tracks, making it possible to move directly from one car to another on an adjacent track, it can handle materials up to two-inch size in box cars. A pantograph arm equipped with a scoop reaches into the car until it meets an obstruction, drops down and withdraws a load of material, discharging it to a track-side hopper.

The cycle continues automatically, a lone operator taking only time enough from other jobs to direct the arm to various sections of the car.

The company says an unloading operation can be completed in one-half man hour. For further information on the box car unloader, fill out a **Reader Service** card, using **Code Number 5-1.**

5-2 Bag Flattener



Power Curve Bag Flattener

Precious storage space can't be utilized to the utmost if bags are bulky and rounded. Power Curve Conveyor Co. says it can correct the situation with its Bag Flattener.

The organization says its machine is doing a remarkable job in the fertilizer industry. It is a completely self-contained unit and comes ready to plug in and use.

By putting bags into neat shape, the company says, the Bag Flattener can save up to 30 per cent in warehouse and shipping space. Damage in transit also is reduced with neat packages and they are easier to handle, according to company literature.

In operation, burlap or cotton bags are carried between two power-driven conveyors consisting of endless steel springs operating over grooved rollers.

A leveling action takes place, creating a uniform thickness throughout the bag as it passes between the staggered upper and lower rollers. For further information fill out a **Reader Service** card, using **Code Number 5-2.**

St. Regis Ups Lozier

Kenneth D. Lozier has been elected a vice president of St. Regis Paper Co. and B. W. Recknagel has been named assistant secretary of the company.

Lozier joined St. Regis 13 years ago. In his new post he will be responsible for all advertising and sales promotion for the various divisions of the company.

Industrial News

Assists Stauffer

Archie E. Albright, Jr.

Archie E. Albright Jr. has been named assistant to Hans Stauffer, executive vice president of Stauffer Chemical Co.

Albright formerly was associated with the law firm of Patterson, Belknap and Webb of New York City.

Cockerman Joins Arkell

New sales representative for Arkell & Smiths southern division sales force is T. R. Cockerman, who will represent the company in the Florida territory. Cockerman served with Brown Paper Industries for three years before joining Arkell & Smiths.

He replaces T. F. Sheridan who has been shifted to the Mobile office.

For Sale

Steel Tanks for Sale: Dished heads—all welded. Excellent for storing liquid fertilizer, chemicals, etc.
At Marion, Ind.—(12) 12,700 gal., (4) 11,000 gal., (6) 5,500 gal. At Norfolk, Va.—(13) 15,200 gal., (3) 5,800 gal. At Tonawanda, N. Y.—(5) 7,000 gal. At Mt. Carmel, Pa.—(9) 4,600 gal., (5) 4,300 gal. (2) 3,800 gal. Perry Equipment Corp., 1430 N. 6th Street, Phila. 22, Pa.

Poly-Ack for Farm

A new formulation of Poly-Ack developed especially for agricultural use has been announced by Wilson Organic Chemicals, Inc.

James A. Wilson, director of Poly-Ack sales, says the new product, called Poly-Ack 15 controls soil crusting and hard-panning and thus accelerates germination, increases moisture and fertilizer penetration and facilitates seedling emergence.

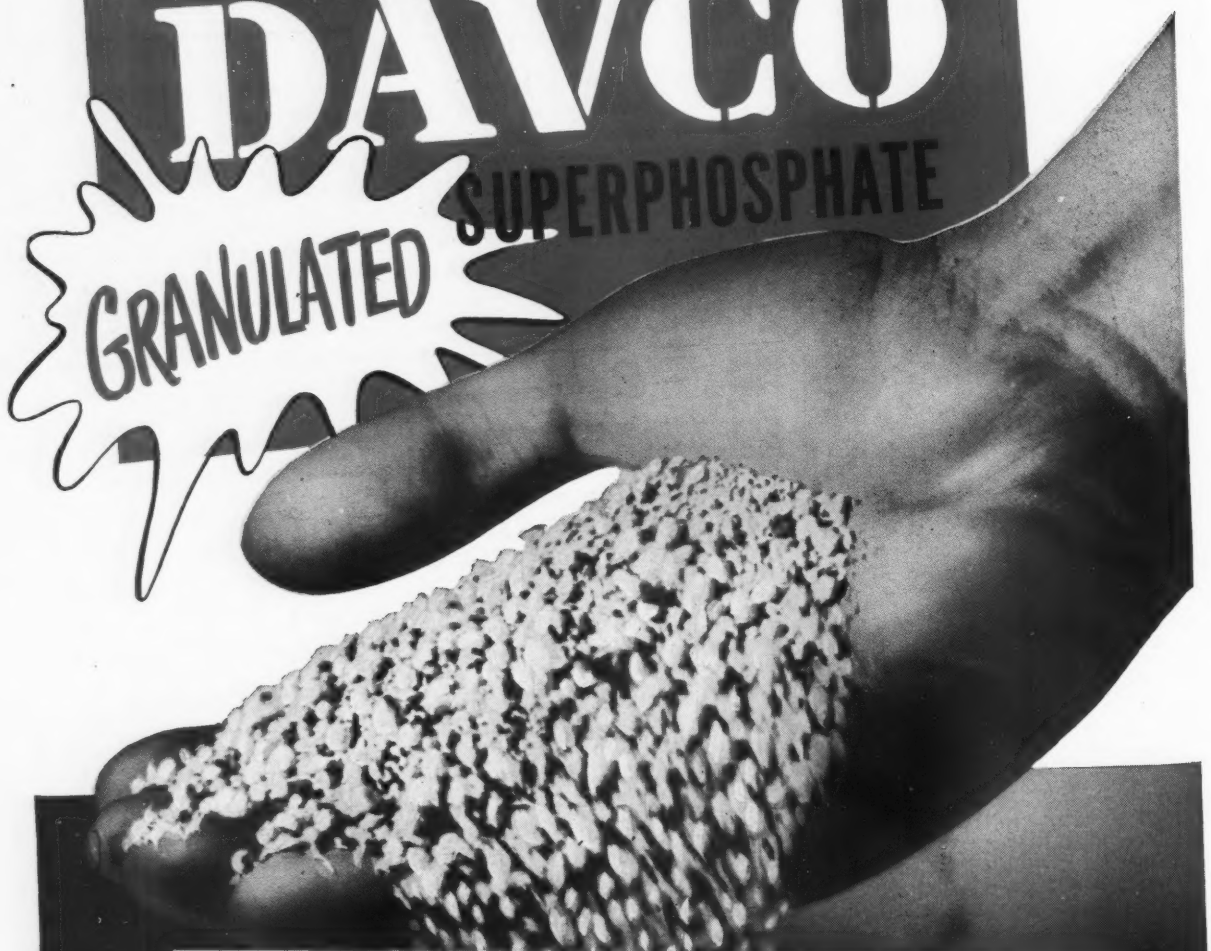
Asher Joins Spencer

New member of the sales division of Spencer Chemical Co. is C. R. Asher, of Monticello, Ill. He replaces Francis E. Best as Illinois sales representative for Spencer. Best was shifted to Missouri.

"The Peak of Perfection for Crop Protection"
COPPER SULPHATE
NICHOLS
TRIANGLE BRAND
PHELPS DODGE REFINING CORPORATION
NICHOLS
COPPER SULPHATE
40 WALL ST. NEW YORK
PHELPS DODGE REFINING CORPORATION
Copper Sulphates
for Sprays • Dusts • Fertilizers
For over sixty years Triangle Brand Copper Sulphates in various forms have been the standard of quality for agricultural chemicals.
In the preparation of Bordeaux Mixture sprays the new method using Triangle Brand "Instant" Copper Sulphate 99% pure has superseded the old formulations. Requiring no need of a stock solution, the "Instant" form may be added directly to a Chemically Hydrated lime which need not be slaked.
Dusts are most effective when prepared with Triangle Brand Basic Copper Sulphate and the proper diluent. No lime is necessary. Concentrations of from 7-10% copper can be maintained.
Fertilizers with Triangle Brand Copper Sulphate added in their formulation will provide the necessary amount of this element vital to better crops.
Triangle Brand Copper Sulphate is available in Large and Small Crystals, Superfine (new snow form), and the "Instant" (powder) forms which contain 25.2% metallic copper. Triangle Brand Basic Copper Sulphate is available in powder form (average particle size is 2 microns) and contains 53% metallic copper.
PHELPS DODGE REFINING CORP.
40 WALL ST., NEW YORK 5, N.Y. • 230 N. MICHIGAN AVE., CHICAGO, ILL.

DAVCO*

GRANULATED SUPERPHOSPHATE



OFFERS YOU 3-WAY CONTROL

- **STORAGE CONTROL— No caking or lumping while in storage.**
- **APPLICATION CONTROL — No dusting or bridging; drills free and even.**
- **FOOD CONTROL — Supplies plant food at a uniform rate.**

You can actually see and feel the difference in DAVCO Granulated Superphosphate. You and your customers can tell why Granulated Superphosphate will not cake no matter how long it is kept in storage. And you can see the reasons for its ease in drilling . . . the fact that it will not dust nor bridge over. Granulated Superphosphate drills freely and evenly in the field giving complete coverage. And because of the granular structure, plant food is released at desirable rates.

DAVCO GRANULATED SUPERPHOSPHATE gives the added points which can make a sale and in turn will keep that customer sold. Order your superphosphate now, but be sure it is DAVCO GRANULATED SUPERPHOSPHATE WITH THE 3-WAY CONTROL.

*Reg. T. M.

Progress Through Chemistry

THE DAVISON CHEMICAL CORPORATION

BALTIMORE 3, MARYLAND

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS AND SILICOFLUORIDES. SOLE PRODUCERS OF DAVCO GRANULATED FERTILIZERS.

Industrial News

Allstetter Says Farmers Need Fertilizer Funds

Farmers will need from $400 to $500 million more working capital just for the purchase of fertilizers during the 1953–1955 period, according to W. R. Allstetter, vice president of the National Fertilizer Association.

He made the statement at the Fifth Annual Soil Fertility Conference in Vincennes, Ind.

"Funds for purchasing the additional fertilizers may well need to be supplied from credit sources," Allstetter said, "in view of the cost-price squeeze in which farmers find themselves."

"In fact," he added, "many farmers who in the past have been able to purchase their fertilizers with their own funds may require some financing just to maintain their past level in purchases."

U. S. Could Become 'Land Poor' By Feeding Others

There is a danger that the United States may eventually become land poor in its charitable effort to "feed the world" according to a bio-chemist for U. S. Industrial Chemicals Co.

Dr. H. J. Prebluda made the comment at the annual meeting of the National Farm Chemurgic Council.

"There are indications that there is a direct relationship between the return of organic matter to the soil and formation of antibiotics in the ground," he stated.

He said this is an "entirely new concept in the use of organic matter for controlling plant disease."

General topic of Dr. Prebluda's talk was "Returning Wastes to the Soil."

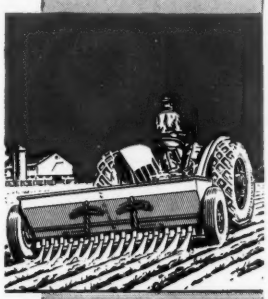
Kolker Changes Name

The former Kolker Chemical Works, Inc., now is known as Diamond Alkali Organic Chemicals Division.

Diamond Alkali Co., the parent organization, announced the name change. It purchased Kolker in 1951, with plants in Newark, N. J. and Houston, Tex.

TC TENNESSEE CORPORATION

MINERAL SALTS



COPPER SULPHATE

ZINC SULPHATE

MANGANESE SULPHATE

MAGNESIUM SULPHATE

BORON

FERRIC IRON SULPHATE

Minerals are just as essential to healthy plant growth and optimum production of vitamin-rich crops as are nitrogen, potash and phosphate. Mineralized fertilizer stimulates sales and creates new business because the results are conclusive. Fertilizers that give superior results are the fertilizers that the growers buy.

As basic producers of minerals, we would like to discuss mineralized fertilizer with you and show you how to increase your fertilizer tonnage and profits by the addition of minerals.

We can supply mineral mixtures to your own specifications in large or small quantities.

SOLUBLE TRACE MINERALS

Tennessee's trace minerals are soluble and their nutritional value is immediately available to the plant. Soluble trace minerals are more economical and faster acting.

For detailed information, phone, wire or write—

TC TENNESSEE CORPORATION

TENNESSEE CORPORATION

617-29 Grant Building, Atlanta, Georgia

Industrial News

Dixie Guano Adding Fully-Automatic Unit

Construction of a fully-automatic addition to its fertilizer plant is underway at the Dixie Guano Co. plant at Laurinburg, N. C.

The addition will contain 39,000 square feet of space, and was started to step up production and to facilitate deliveries during rush periods.

It will be of standard steel-frame construction and is being built by the Luria Engineering Co., at its fabricating plant in Bethlehem, Pa.

Only one man will be required during seasonal lulls to fill the entire bulk storage area with 12,000 tons of bulk mixed materials when the new unit is completed.

Thus the company will be enabled to have a substantial inventory ready for processing and packaging when orders reach their peak during the spring planting season.

It is scheduled to be completed in June, with occupancy tentatively set for October.

Southwest Potash Report

A report on Southwest Potash Corp., together with a full color photograph of the plant at Carlsbad, N. M. is featured in the annual report of the American Metal Co., Ltd.; of which Southwest is a wholly-owned subsidiary.

The report stated that the plant, put into operation last August, is operating satisfactorily at a rate in excess of the initially estimated expansion as market conditions might justify.

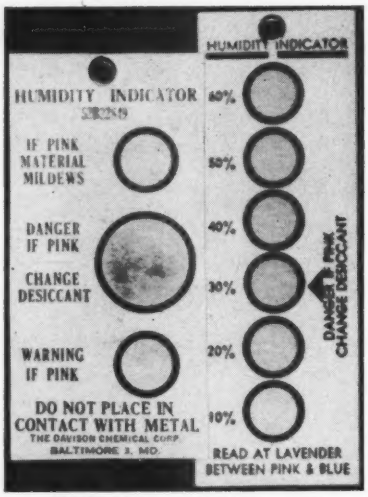
It said further enlargement already is under study.

Sulfur Production

Production of domestic sulfur totaled 418,568 long tons of the native material and 28,239 tons of recovered sulfur during January, according to the mineral industrial survey of the U. S. Department of the Interior.

Producer's stocks of native sulfur increased and at the end of January stood at 3,130,379 tons.

5-18 Humidity Cards



Davison Humidity Indicators

If humidity is an important factor in your specialty packaging process you may be interested in novel cards developed by Davison Chemical Corp.

The cards have "Tell-Tale" spots for use in dehydrated packaging. Changes in moisture conditions cause the spots to change color rapidly, reliably indicating relative humidity.

Principal use of the cards, according to Davison, is to give visual evidence of whether humidity conditions within a package are at a safe level, to avoid moisture vapor damage. Additional information is available from the company. Fill out a **Reader Service** card, using **Code Number 5-18.**

Lion Oil Wins Awards Of Honor for Safety

Two awards of honor for safety have been presented to Lion Oil Co. for the accident-prevention record established by its employes last year.

The award is the highest presented by the National Safety Council.

First award was to the company as a whole, including more than 2600 employes, for "a remarkable reduction in the frequency and severity of accidents."

The other went to employes of the company's manufacturing division, consisting of the El Dorado, Ark. refinery and El Dorado chemical plant, for "working in excess of three million man hours without a disabling injury."

Presentation of the awards was made by Ned H. Dearborn, NSC president, to T. M. Martin, president of Lion Oil.

Super Production Drops

A decline in production of normal superphosphate for February compared with the same month in 1952 was reported by the Department of Commerce.

Production totaled 763,046 short tons during the month, an increase of one per cent over January, 1953, but a drop of 12 per cent from the same month last year.

Shipments during February were up 29 per cent from January and were approximately the same as February, 1952. Production of concentrated super showed a 27 per cent increase over last year, totaling 82,330 short tons, while wet base goods was down 17 per cent from last year, totaling 4,219 short tons.

Stocks on hand decreased seven per cent during the month.

Mathieson Buys Powell

Mathieson Chemical Corp. will buy John Powell & Co., Inc. according to an announcement received at press time.

The announcement was made jointly by Thomas S. Nichols, president of Mathieson and H. Alvin Smith, president and treasurer of John Powell.

Purchase of Powell is the latest step in big expansion carried out by Mathieson during the last few years, including acquisition of Squibb drug and pharmaceutical company.

John Powell was founded in 1923 and has been a leading formulator of pesticides since that time.

Industrial News

New Velsicol VP

E. T. Collingsworth, Jr.

E. T. Collingsworth Jr., formerly with Monsanto Chemical Co.'s Phosphate division, has accepted the post of vice president of Velsicol Corp., division of Arvey Corp., Chicago.

Collingsworth will be administrative assistant for the chief operating executive of Velsicol, basic manufacturers of insecticide concentrates.

A chemical engineer and graduate of Harvard Business School, Collingsworth is a member of the American Management Association and the Chemical Market Research Association.

Pival Rodenticide On General Market

A new anti-coagulant rodenticide called Pival has just been released for general sale, Motomco, Inc. announces.

The company, chemical specialty manufacturers and licensees and sole producers of the rat killer, says the release follows a year of comprehensive field and laboratory testing under an experimental permit of the Production and Marketing Administration of the USDA.

Pival will be offered in a .5 per cent concentrate for professional use to pest control operators and sanitarians and to packagers of Pival baits for agricultural, industrial and municipal markets.

Active ingredients of the rodenticide is 2-Pivalyl-1, 3-Indandione. It is used in cereal baits at a concentration of only one part in 4,000. Its lethal action depends on continued eating over a period of several days.

The product is tasteless and odorless and creates no "bait shyness" in rats and mice.

Unique feature of Pival is that it imparts to cereal baits important resistance to both infestation and the onset of mold. The company claims Pival is the only anti-coagulant rodenticide which provides this protection to bait.

Pival originally came to the attention of investigators as a promising insecticide, but commercial development was put aside by the spectacular advent of DDT.

Another test with Pival is being conducted in cooperation with the U. S. Fish and Wildlife Service toward development of a water soluble form of Pival which offers promise of providing specialized protection against rodent contamination in grain storage.

Industrial News

Productivity Called Key To Successful Farming

Increased productivity for farmers is the key to a successful future agriculture, according to a DuPont official.

Dr. Wallace E. Gordon, assistant director of sales of DuPont's Grasselli Chemicals Department, made the statement at the Seventh Annual Farm Forum in Minneapolis.

"Through more application of science to agriculture," he declared, "I believe that we can meet the unknown food requirements of tomorrow's uncounted children without committing ourselves to any drastic and upsetting master plans."

Powell Opens Pesticide Facilities in Brazil

Installation of pesticide manufacturing facilities at Porto Alegre, Brazil, was begun last month by John Powell and Co., Inc.

The move followed establishment in the city of a new unit in the company's expanding group of foreign offices and plants.

H. Alvin Smith, president of Powell, in announcing the new office, said it will be known as John Powell S. A. Comercio e Industria. (FARM CHEMICALS reported establishment of the office in its article on Powell in the March issue.)

Edwin B. Twyman, resident manager in Buenos Aires, will supervise the new unit.

A fundamental objective of the new company is to promote the manufacture of Brazilian raw materials. The company also will introduce to Brazilian manufacturers a line of basic insecticides and concentrates primarily for household and industrial use.

The company was formed in partnership with a Brazilian firm and an American insecticide manufacturer.

FTE Distribution

Ferro Corp. announces that its new soluble soil mineralizer will be made available to home gardeners in one-and five-pound packages by DuPont this spring. Price will be $1 and $2.95, respectively, and the materials will cover 400 and 2,000 square feet.

Vermiculite Co. To Make Fertilizer Conditioner

A fertilizer conditioner and other products will be manufactured by a new division of Macon Brick and Block Co., Macon, Ga.

Establishment of the division, Southeastern Vermiculite Co., was announced by Theron A. Holmes, president of the parent company.

A building was constructed on the company property to house the latest and most efficient vermiculite exfoliating plant in the United States, according to Holmes.

High Analysis Use Up

Use of highly concentrated forms of fertilizers has increased in recent years according to Ralph B. Douglass, president of the Smith-Douglass Co. of Norfolk, Va.

Speaking before a meeting of the New York Society of Security Analysts, Douglass said that a combination of higher transportation, labor and packaging costs coupled with lower farm prices are spurring the trend.

From a Bankers View

A look at fertilizer from a banker's point of view—that's what a new booklet published by the Ohio Bankers Association takes.

Called "Ohio Soil Fertility—Profit Prospects for Bankers," the 18-page color bulletin tells bankers how intimately farm profits are tied to the farmer's ability to get money when he needs it for fertilizer and other farm chemicals.

D. E. Anderson, of the bankers association, said every bank in Ohio will receive a copy of the booklet. It cites typical fixed costs on a farm and tells how an additional amount of money spent for fertilizers can boost net profits.

New Cal-Spray Plant

Pesticides for Arkansas customers will be manufactured in a $100,000 insecticide plant being constructed by California Spray-Chemical Co., of Shreveport, La. The plant is nearing completion at a site in Pine Bluff, Ark.

KILLS RATS with Warfarin

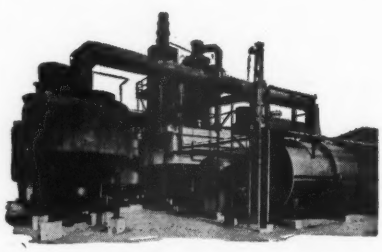
- Low Cost
- Proved Effective
- Immediate Delivery

It costs you $20 a year to keep a rat, but only 5¢ to kill it. Rat Cafe Bait Station available in boxboard or heavy duty steel. Low price will amaze you. Write for information.

Universal ELECTRIC PRODUCTS
2203 Regent St. Madison 5, Wis.

CHEMICO PLANTS

are profitable investments



Chemico's services cover every detail in design and construction of sulphuric acid plants, acid concentrators, complete fertilizer plants and P-A Venturi Scrubbers for fluorine fume elimination.

Chemico's performance guarantees are backed up by 38 years of experience. Consultation involves no obligation.

CHEMICAL CONSTRUCTION CORPORATION

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Buyers' Guide

Classified Index to Advertisers in 'Farm Chemicals'

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Bailey & Lerch, Washington, D. C.

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Ashcraft-Wilkinson Co., Atlanta, Ga.
Gen. Chem. Div., Allied Chem. & Dye, N.Y.C.
Julius Hyman & Co. Div., Shell Chemical Corp., Denver, Colo.
Pittsburgh Agricultural Chemical Co., N. Y. C.

AMMONIA—Anhydrous and Liquor
Mathieson Agricultural Chemicals Co., Little Rock, Ark.
Lion Oil Co., El Dorado, Ark.
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
Phillips Chemical Co., Bartlesville, Okla.
Spencer Chemical Co., Kansas City, Mo.

AMMONIUM NITRATE
Ashcraft-Wilkinson Co., Atlanta, Ga.
Lion Oil Co., El Dorado, Ark.
McIver & Son, Alex. M., Charleston, S. C.
Phillips Chemical Co., Bartlesville, Okla.
Spencer Chemical Co., Kansas City, Mo.

AMMONIUM PHOSPHATE
Monsanto Chem. Co., St. Louis, Mo.

AMMONIUM SULFATE
See Sulfate of Ammonia

AMMONIUM SULFATE NITRATE
Baker & Bro., H. J., New York City

BAGS—Burlap
Bemis Bros. Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago
Mente & Co., Inc., New Orleans, La.
McIver & Son, Alex. M., Charleston, S. C.
Virginia-Carolina Chemical Corp., Richmond, Va.

BAGS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.
Mente & Co., Inc., New Orleans, La.
McIver & Son, Alex. M., Charleston, S. C.
Virginia-Carolina Chemical Corp., Richmond, Va.

BAGS—Multiwall-Paper
Bemis Bro. Bag Co., St. Louis, Mo.
International Paper Co., Bagpak Div., N. Y. C.
Hammond Bag & Paper Co., Wellsburg, W. Va.
Hudson Pulp & Paper Corp., N. Y. C.
Jaite Company, The, Jaite, Ohio
Kraft Bag Corporation, New York City
Mente & Co., Inc., New Orleans, La.
McIver & Son, Alex. M., Charleston, S. C.
Raymond Bag Co., Middletown, Ohio
Union Bag & Paper Corp., New York City
Virginia-Carolina Chemical Corp., Richmond, Va.

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
McIver & Son, Alex. M., Charleston, S. C.

BAG CLOSING MACHINES
Fischbein Co., Dave, Minneapolis, Minn.
International Paper Co., Bagpak Div., N. Y. C.

BAG CLOSING—THREAD & TWINE
Bemis Bros. Bag Co., St. Louis, Mo.
Mente & Co., Inc., New Orleans, La.

BAG PRINTING MACHINES
Schmutz Mfg., Louisville, Ky.

BAG FILLING MACHINES
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

BHC AND LINDANE
Ashcraft-Wilkinson Co., Atlanta, Ga..
Diamond Alkali Co., Newark, N. J.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Gen. Chem. Div., Allied Chem. & Dye, N.Y.C.
Mathieson Agricultural Chemicals Co., Little Rock, Ark.
Pittsburgh Agricultural Chemical Co., N. Y. C.
Wyandotte Chemicals Corp., Wyandotte, Mich.

BONE PRODUCTS
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Jackle, Frank R., New York City
McIver & Son, Alex M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BORAX AND BORIC ACID
American Potash and Chem. Corp., N. Y. C.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BUCKETS—Hoist, Crane, etc.
Hayward Company, The, New York City

CALCIUM ARSENATE
American Agricultural Chemical Co., N. Y. C.
Gen. Chem. Div., Allied Chem. & Dye, N.Y.C.

CARS AND CART
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

CASTOR POMACE
Ashcraft-Wilkinson Co., Atlanta, Ga.
McIver & Son, Alex. M., Charleston, S. C.

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Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Wiley & Company, Baltimore, Md.

CHLORDANE
Ashcraft-Wilkinson Co., Atlanta, Ga.
Gen. Chem. Div., Allied Chem. & Dye, N.Y.C
Pittsburgh Agricultural Chemical Co., N. Y. C.

CLAY
Ashcraft-Wilkinson Co., Atlanta, Ga.

CONDITIONERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
National Lime & Stone Co., Findlay, Ohio

CONTROL SYSTEMS
Sackett & Sons Co., The A. J., Baltimore, Md.

CONVEYORS—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

COPPER SULFATE
Phelps Dodge Refining Corp., New York City
Tennessee Corp., Atlanta, Ga.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa

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Diamond Alkali Co., Newark, N. J.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Gen. Chem. Div., Allied Chem. & Dye, N.Y.C.
Mathieson Agricultural Chemicals Co., Little Rock, Ark.
Monsanto Chemical Co., St. Louis, Mo.
Pittsburgh Agricultural Chemical Co., N. Y. C.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Wyandotte Chemicals Corp., Wyandotte, Mich.

DIELDRIN
Ashcraft-Wilkinson Co., Atlanta, Ga.
Julius Hyman & Co. Div., Shell Chemical Corp., Denver, Colo.
Pittsburgh Agricultural Chemical Co., N. Y. C.

DILUENTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Pittsburgh Agricultural Chemical Co., N. Y. C.
Wyandotte Chemicals Corp., Wyandotte, Mich.

DITHIOCARBAMATES
Berkshire Chemicals, New York City
DuPont de Nemours & Co., E. I., Wilmington, Del.

DRYERS
Sackett & Sons Co., The A. J., Baltimore, Md.

ELEVATORS—Bucket
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

EMULSIFIERS
Atlas Powder Co., Wilmington, Del.
Wyandotte Chemicals Corp., Wyandotte, Mich.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City
Fairlie, Inc., Andrew M., New York City
General Industrial Development Corp., N. Y. C.
Marietta Concrete Corporation, Marietta, Ohio
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.
Titlestad Corporation, Nicolay, New York City

FERTILIZER—Mixed
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Davison Chemical Corporation, Baltimore, Md.
International Min. & Chem. Corp., Chicago, Ill.
Mathieson Agricultural Chemicals Co., Little Rock, Ark.
Southern States Phosphate & Fertilizer Co., Savannah, Ga.
Virginia-Carolina Chemical Corp., Richmond, Va.

FILLERS
McIver & Son, Alex. M., Charleston, S. C.
Universal Detergents Inc., Long Beach, Cal.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston. S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

FULLER'S EARTH
Ashcraft-Wilkinson Co., Atlanta, Ga.

FUNGICIDES
American Agricultural Chemical Co., N. Y. C.
Berkshire Chemicals, New York City
DuPont de Nemours & Co., E. I., Wilmington, Del.
Gen. Chem. Div., Allied Chem. & Dye, N. Y. C.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Tennessee Corp., Atlanta, Ga.

GAS MASKS
Willson Products, Inc., Reading, Pa.

GOGGLES
Willson Products, Inc., Reading, Pa.

HERBICIDES
Diamond Alkali Co., Newark, N. J.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Lion Oil Company, El Dorado, Ark.
Monsanto Chemical Co., St. Louis, Mo.
Pittsburgh Agricultural Chemical Co., N. Y. C.
Wyandotte Chemicals Corp., Wyandotte, Mich.

HERBICIDES—Oils
Gen. Chem. Div., Allied Chem. & Dye, N.Y.C.
Lion Oil Company, El Dorado, Ark.

HOPPERS & SPOUTS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind..

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Berkshire Chemicals, New York City
DuPont de Nemours & Co., E. I., Wilmington, Del.
Southern States Phosphate & Fertilizer Co., Savannah, Ga.
Woodward & Dickerson, Inc., Philadelphia, Pa.

INSECTICIDES
American Agricultural Chemical Co., N. Y. C.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Berkshire Chemicals, New York City
Diamond Alkali Co., Newark, N. J.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Gen. Chem. Div., Allied Chem. & Dye, N.Y.C
Julius Hyman & Co. Div., Shell Chemical Corp., Denver, Colo.
Pittsburgh Agricultural Chemical Co., N. Y. C.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Powell & Co., John, New York City
U. S. Industrial Chemicals Co., New York City
Virginia-Carolina Chemical Corp., Richmond, Va.
Wyandotte Chemicals Corp., Wyandotte, Mich.

IRON SULFATE
Tennessee Corp., Atlanta, Ga.

LEAD ARSENATE
American Agricultural Chemical Co., N. Y. C.
Gen. Chem. Div., Allied Chem. & Dye, N.Y.C.

LIMESTONE
American Agricultural Chemical Co., N. Y. C.
Ashcraft-Wilkinson Co., Atlanta, Ga.
McIver & Son, Alex. M., Charleston, S. C.
National Lime & Stone Co., Findlay, Ohio
Pittsburgh Agricultural Chemical Co., N. Y. C.

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LOADERS—Car and Wagon
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making and Handling
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Acidulating
Chemical Construction Corp., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Ammoniating
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Granulating, Fertilizer
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, The, East Point, Ga.
Bradley Pulverizer Co., Allentown, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY—Material Handling
Atlanta Utility Works, The, East Point, Ga.
Hayward Company, The, New York City
Hough, The Frank G. Co., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY—Mixing, Screening and Bagging
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Power Transmission
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY
Superphosphate Manufacturing
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

MAGNESIUM SULFATE
Berkshire Chemicals, New York City

MANGANESE SULFATE
McIver & Son, Alex. M., Charleston, S. C.
Tennessee Corp., Atlanta, Ga.

MANURE SALTS
Potash Co. of America, Washington, D. C.

MINOR ELEMENTS
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

NITRATE OF POTASH
Berkshire Chemicals, New York City

NITRATE OF SODA
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
International Min. & Chem. Corp., Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NITROGEN SOLUTIONS
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
Lion Oil Company, El Dorado, Ark.
Phillips Chemical Co., Bartlesville, Okla.
Spencer Chemical Co., Kansas City, Mo.

NITROGEN MATERIALS—Organic
American Agriculture Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.
Spraying Systems Co., Bellwood, Ill.

PARATHION
Ashcraft-Wilkinson Co., Atlanta, Ga.
Monsanto Chemical Co., St. Louis, Mo.
Pittsburgh Agricultural Chemical Co., N. Y. C.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.

PENTACHLOROPHENOL
Monsanto Chemical Co., St. Louis, Mo.

PHOSPHATE ROCK
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
International Min. & Chem. Corp., Chicago, Ill.
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Virginia-Carolina Chemical Corp., Richmond, Va.
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PHOSPHORIC ACID
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Virginia-Carolina Chemical Corp., Richmond, Va.

PLANT CONSTRUCTION—Fertilizer and Acid
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Chemical Construction Corp., New York City
General Industrial Development Corp., N. Y. C.
Monsanto Chemical Co., St. Louis, Mo.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.
Titlestad Corporation Nicolay, New York City

POTASH—Muriate
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Ashcraft-Wilkinson Co., (Duval Potash) Atlanta, Ga.
Duval Sulphur & Potash Co., Houston, Tex.
International Min. & Chem. Corp., Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Potash Co. of America, Washington, D. C.
Southwest Potash Corp., New York City
United States Potash Co., N. Y. C.

POTASH—Sulfate
American Potash & Chemical Corp., N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Potash Co. of America, Washington, D. C.

POTASSIUM PHOSPHATE
Monsanto Chemical Co., St. Louis, Mo.

PRINTING PRESSES—Bag
Schmutz Mfg. Co., Louisville, Ky.

PYROPHYLLITE
Ashcraft-Wilkinson Co., Atlanta, Ga.

REPAIR PARTS AND CASTINGS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

RESPIRATORS
Willson Products, Inc., Reading, Pa.

RODENTICIDES
Universal Electric Products, Inc., Madison, Wis.

SACKING UNITS
Sackett & Sons Co., The A. J., Baltimore, Md.

SCALES—Including Automatic Baggers
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Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

SCREENS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman Foundry and Machine Co., Aurora, Ind.

SEPARATORS—Air
Sackett & Sons Co., The A. J., Baltimore, Md.

SOIL CONDITIONERS
Goodrich Chemical Co., B. F., Cleveland, Ohio
Wyandotte Chemicals Corp., Wyandotte, Mich.

SPRAYS
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Spraying Systems Co., Bellwood, Ill.

STORAGE BUILDINGS
Marietta Concrete Corporation, Marietta, Ohio

SULFATE OF AMMONIA
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Armour Fertilizer Works, Atlanta, Ga.
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Mathieson Agricultural Chemicals Co., Little Rock, Ark.
McIver & Son, Alex. M., Charleston, S. C.
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United States Steel Corp., New York City
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SULFATE OF POTASH—MAGNESIA
International Min. & Chem. Corp., Chicago, Ill.

SULFUR
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Mathieson Agricultural Chemicals Co., Little Rock, Ark.
Texas Gulf Sulphur Co., New York City
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SULFUR—Dusting & Spraying
Ashcraft-Wilkinson Co., Atlanta, Ga.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
U. S. Phosphoric Products Div., Tennessee Corp., Tampa, Fla.

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Lion Oil Company, El Dorado, Ark.
Monsanto Chemical Co., St. Louis, Mo.
McIver & Son, Alex. M., Charleston, S. C
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U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

SURFACE ACTIVE AGENTS
Universal Detergents Inc., Long Beach, Cal.

SUPERPHOSPHATE
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Ashcraft-Wilkinson Co., Atlanta, Ga.
Davison Chemical Corporation, Baltimore, Md.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
Mathieson Agricultural Chemicals Co., Little Rock, Ark.
McIver & Son, Alex. M., Charleston, S. C.
Southern States Phosphate Fertilizer Co., Savannah, Ga.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Min. & Chem. Corp., Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.
Woodward & Dickerson, Inc., Philadelphia, Pa.

TALC
Ashcraft-Wilkinson Co., Atlanta, Ga.

TANKAGE
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Ashcraft-Wilkinson Co., Atlanta, Ga.
International Min. & Chem. Corp., Chicago, Ill.
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McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

TEPP
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Virginia-Carolina Chemical Corp., Richmond, Va.

TOXAPHENE
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Gen. Chem. Div., Allied Chem. & Dye, N.Y.C.
Monsanto Chemical Co., St. Louis, Mo.
Pittsburgh Agricultural Chemical Co., N. Y. C.

2, 4, 5-T
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Gen. Chem. Div., Allied Chem. & Dye, N.Y.C.
Monsanto Chemical Co., St. Louis, Mo.
Pittsburgh Agricultural Chemical Co., N. Y. C.

UREA & UREA PRODUCTS
DuPont de Nemours & Co., E. I., Wilmington, Del.
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C

VALVES
Atlanta Utility Works, The, East Point, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.

WETTING AGENTS
Universal Detergents Inc., Long Beach, Cal.
Wyandotte Chemical Corp., Wyandotte, Mich.

ZINC SULFATE
Tennessee Corp., Atlanta, Ga.

Leaving its 'teens . . .

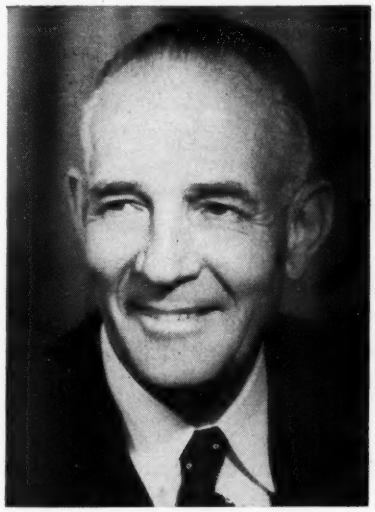
NAC Set for 20th Anniversary

THE National Agricultural Chemicals Association has come a long way in 20 years. So, of course, has the pesticide industry, the growth of which is reflected directly by the growth of the association representing it.

Undeterred by occasional bad seasons, such as the one just "weathered," the NAC is planning to observe its twentieth birthday at the annual meeting in Spring Lake, N. J.

The meeting is scheduled for Sept. 9, 10 and 11 in the Essex and Sussex Hotel, according to Lea Hitchner, executive secretary of NAC.

One indication of the tremendous growth of the association may be found in a pre-convention announcement from NAC that "because our membership has grown to the point where the Essex and Sussex can no longer accommodate all of our representatives, plans are being made to have accommodations also at the Monmouth Hotel."



NAC President **A. W. Mohr**

Attendance at the September anniversary meeting is expected to top the 500 total at last year's meeting.

Special feature of the meeting will be a panel of seven ex-presidents of the association, who will be asked to discuss the industry's status and to compare the present-day marketing activities, production and technical problems of the industry with those of former years.

Arrangements committee for the Spring Lake convention already has made preliminary plans for observance of the 20th anniversary.

Included on the tentative program are formal sessions on the mornings of each of the three days.

Reports by officers of the association on action by the group during the preceding year highlight the sessions, together with addresses by industry leaders and officials of government agencies.

One session will feature a discussion of various technical problems confronting the industry, including formulation of pesticidal chemicals, effects of pesticides on soils, legislative trends, exports and other topics. ◆

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It's Big Enough, Thanks

IF the farm chemicals field were shrinking; if the need for fertilizers to help grow crops and pesticides to protect them were diminishing, FARM CHEMICALS might follow the lead of a new publication in including the whole province of food and agriculture in its domain.

If we thought there wasn't much of a future for plant foods and plant protectants we might widen our editorial horizons to include something more to talk about.

But, fortunately for this country—for its farmers and citizens—as well as for the fertilizer and pesticide industries, such is not the case.

In short, we've got plenty to talk about now.

The farm chemicals field, as anyone who has the slightest knowledge of it must know, isn't shrinking. On the contrary it's one of the fastest growing industries in the country.

The industry has an increasingly bigger job to do as our population increases. (That's been the theme of most of the recent trade meetings.) It has been developing new chemicals, improving old ones, modernizing its processes and providing scores of ways for our farmers to do their jobs better and more efficiently.

TO keep up with this expansion should FARM CHEMICALS increase its area of coverage or try to grow along with our chosen field of interest? It seems natural to us, and we think you readers will agree, that we have a big enough job at hand in covering all the complexities of our own field.

That's why we increased the size of our magazine recently to enable us to include more of the articles we think you will want to read: articles about new construction in the industry, new processes and chemicals and improved methods of formulating fertilizers and pesticides.

We added our special series on farm chemicals plants to show members of the industry how representative formulators meet and solve the problems that face all of you in the course of your business.

Sure, what happens to crops after they are harvested is important. The canning, preserving and marketing of the crops are pertinent factors in our economy. But these factors, in our minds, rightfully form another story—a story that best can be told by magazines devoted exclusively to those portions of the food field.

That's why we are limiting our sights to fertilizers and pesticides. We have tried to improve and enhance our coverage of the fields in recent months; we have other editorial improvements planned for the future.

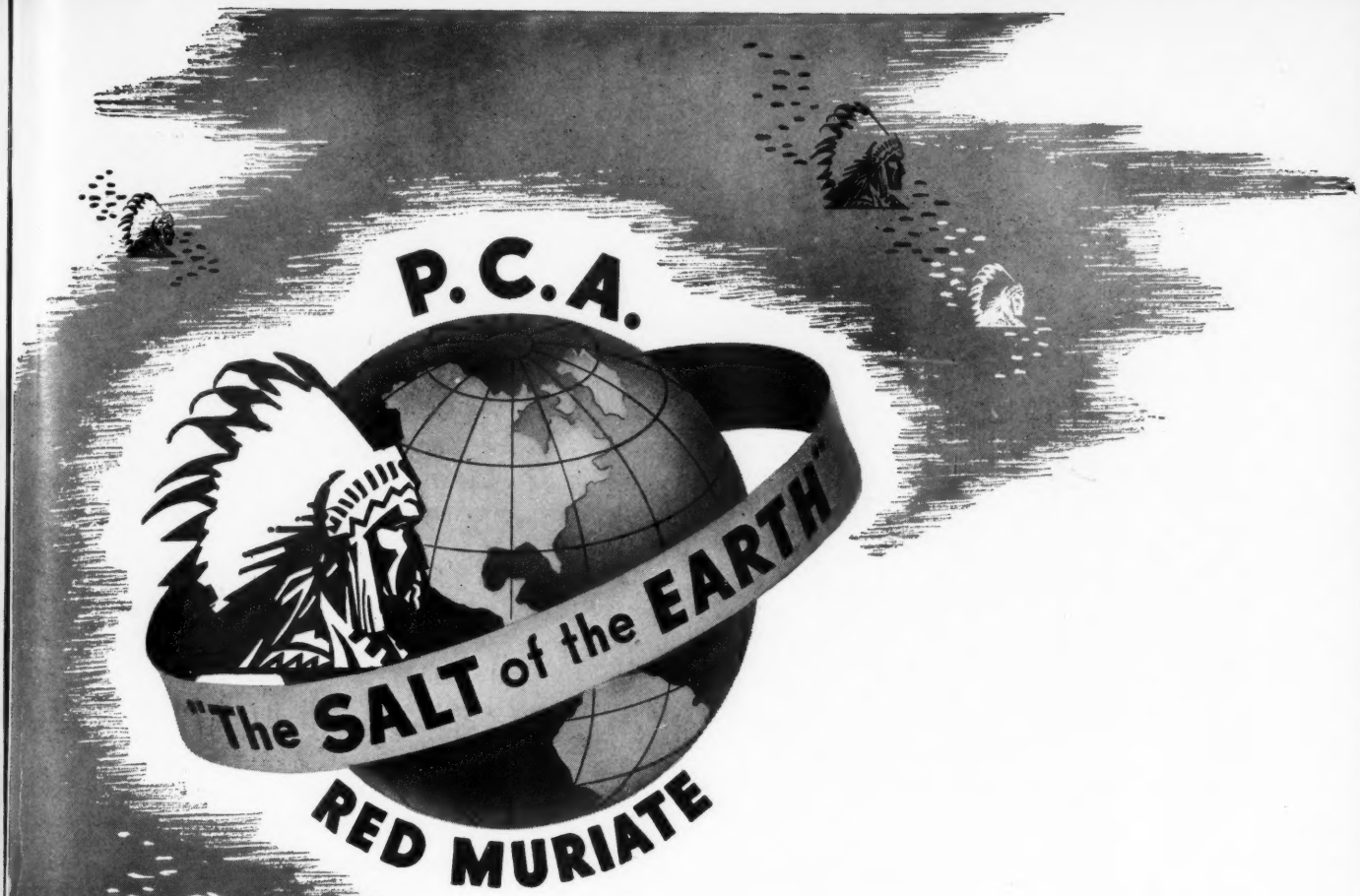
WE are confident our readers will like our approach. And we think our advertisers as well will agree with our policy.

Just as readers have indicated they prefer close editorial observation on our part of their particular problems to more general articles covering a much wider range, so, we think, our advertisers (and future advertisers) will want to get their messages across to the people that count *and only to the people that count.*

Already we have a tough time trying to cover the farm chemicals field completely, to everybody's liking.

We will continue focusing our editorial attention on this important field—we're not trying to hit the broad side of a barn door.

—HAMILTON C. CARSON



• *New frontier*

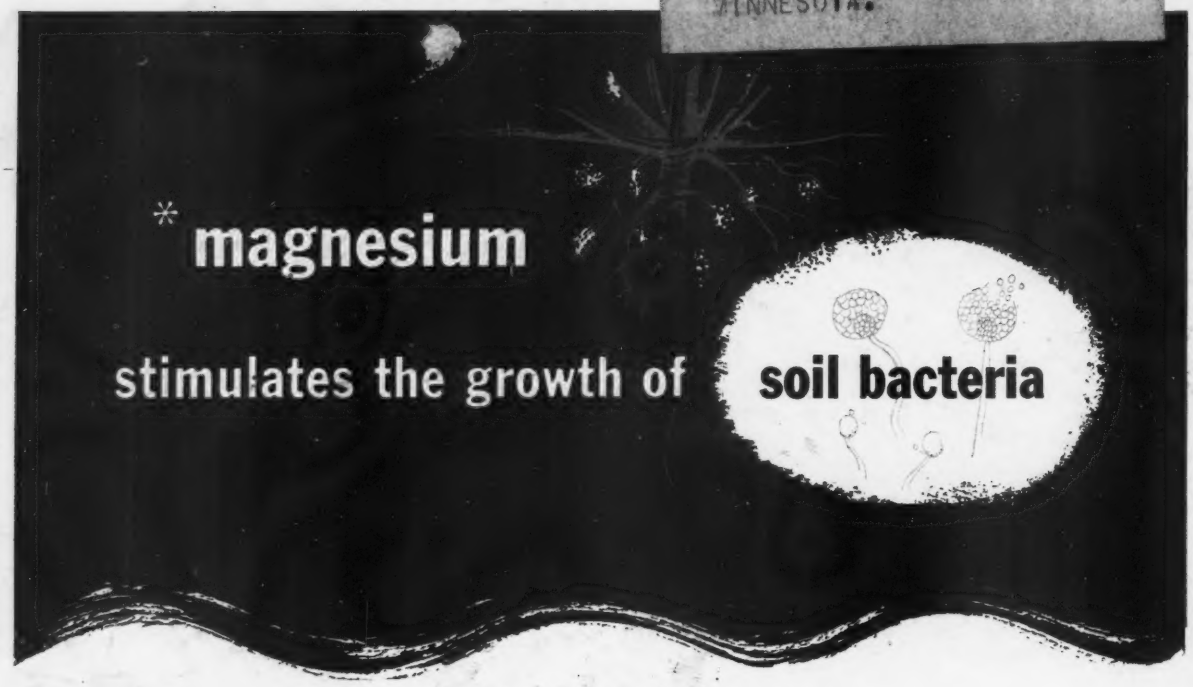
Years ago when Horace Greeley was counselling young men to "go west," there were millions of rich acres to be claimed and farmed. Today, the new challenge to man's ambition is in the build-up of impoverished lands.

Potash Company of America, a prime producer of unexcelled red muriate potash, is proud of its position as a major contributor to the reclamation of these lands.

POTASH COMPANY of AMERICA
Carlsbad, New Mexico

General Sales Office . . . 1625 Eye Street, N. W., Washington, D. C.
Midwestern Sales Office . . . First National Bank Bldg., Peoria, Ill.
Southern Sales Office . . . Candler Building, Atlanta, Ga.

LIBRARY UNIVERSITY FARM,
ST. PAUL 8, MINNESOTA. ZONE-8



Include Soluble Magnesium in Your Quality Fertilizers

Sul-Po-Mag®
Water-Soluble
Double Sulfate of Potash-Magnesia

Magnesium is the basic metallic element in chlorophyll, the green plant substance which captures the sun's energy that is vital for life and growth.

Magnesium concentrates in the seed with phosphorus to aid in the formation of oils and proteins required for viable seed.

Magnesium functions as a carrier of phosphates to the actively growing and fruiting parts of the plant.

Magnesium is required to activate the processes which stimulate the production and transport of carbohydrates and proteins within the growing plant.

Magnesium, in sufficient quantities, enables the plant to utilize other plant nutrients for healthy, disease-resistant growth.

* Magnesium stimulates the growth of soil bacteria and increases the nitrogen-fixing power of legumes.

In the plow layer of an acre of good soil, there are about five tons of living matter working constantly to help the farmer grow his crops. This soil life can survive and function properly only in a fertile soil containing adequate magnesium. Soil organisms, from earth worms to microscopic bacteria and fungi, break down organic matter to improve soil structure and release plant nutrients. The very important nitrogen-fixing bacteria in the root nodules of legumes require magnesium to transform the nitrogen in the air into forms that can be utilized by growing plants.

When the supply of magnesium is deficient, all these valuable organisms cannot carry on their life-giving functions. Fortunately, magnesium-deficient soils can be rebuilt quickly and economically with *Sul-Po-Mag*. Produced exclusively by *International*, *Sul-Po-Mag* contains balanced proportions of sulfate of magnesium and sulfate of potash. Both are water soluble and immediately available to the soil organisms and the plant itself. *Sul-Po-Mag* is available in bulk for mixing with your quality fertilizers and is bagged for direct application to the soil.

Farmers are getting profitable results from the use of *Sul-Po-Mag* with a wide variety of crops. It is not surprising that more and more farmers are asking for quality fertilizers containing *Sul-Po-Mag*.

International Minerals & Chemical

MURIATE OF POTASH
SULFATE OF POTASH
SUL-PO-MAG

Mined and Refined at Carlsbad by International for Fertilizer Manufacturers

POTASH DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION
General Offices: 20 North Wacker Drive, Chicago 6